STAKEHOLDER NETWORK INFLUENCES ON LOCAL-LEVEL HAZARD MITIGATION PLANNING OUTPUTS

Lindsey Ward Lyles

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Approved by:

Dr. Philip R. Berke
Dr. David R. Godschalk
Dr. Nikhil Kaza
Dr. Gavin P. Smith
Dr. Yan Song
ABSTRACT

LINDSEY WARD LYLES: Stakeholder Network Influences on Local-Level Hazard Mitigation Planning Outputs
(Under the direction of Philip Berke)

Economic losses from natural hazards have increased dramatically and climate change is expected to exacerbate underlying hazard risks. There is widespread consensus that development in hazardous locations as a major cause of increased losses and land use approaches to guide people and property to safer locations are the most effective long-term ways to mitigate long-term hazard risks (e.g. Mileti 1999). Since passage of the Disaster Mitigation Act of 2000 (DMA), local governments are required to adopt hazard mitigation plans developed by networks of stakeholders through planning processes typically led by emergency managers and sometimes including local planners. This new inter-governmental policy framework offers an unique opportunity to examine 1) factors leading to greater use of land use approaches to mitigate hazards and 2) the influence of planners embedded in stakeholder networks in which they are rarely the central, coordinating stakeholder.

This dissertation explores the role of planning networks in fostering shared understandings and joint problem-solving through participatory mitigation planning processes. This study employs a mixed method approach and draws on the concepts, theories and analytical tools of Social Network Analysis (SNA) approach. Plan quality data generated from content analysis of local mitigation plans for 175 coastal jurisdictions in six states were combined with secondary data sources to model the relationship of involvement of local planners to hazard mitigation plan quality. Four cases studies were conducted to examine the influence of hazard mitigation stakeholder networks on land use-related plan quality and implementation. The case studies drew on primary data collected from
hazard mitigation stakeholder surveys, interviews, and in-person visits, as well as document review and secondary data.

Regression model findings indicate statistically significant positive relationships between involvement of local planners and incorporation of more land use approaches. Case study findings show that stronger bonding connections between emergency managers and local planners have contributed to greater incorporation of land use approaches. The case study findings also indicate that network structures with a balance of bonding and bridging connections have contributed to greater incorporation of land use approaches than more hierarchical network structures. Research recommendations and policy recommendations are provided.
DEDICATION

To Gladys Ward Lyles, a lover of knowledge
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Chapter 1

Hazard Mitigation, Land Use Planning

and Stakeholder Networks

1.1. The Need for Land Use Approaches in Hazard Mitigation Planning

Economic losses due to natural hazard events have been growing dramatically for nearly two decades (Mileti 1999, Cutter 2001). The 2004 and 2005 hurricane seasons alone resulted in excess of $150 billion in damages and more than 1000 lives lost (Pielke et al. 2008, National Hurricane Center 2010). Development of hazard-prone locations placing higher levels of people and property at risk is a major cause of increasing losses (Burby 1998, Burby 2006, Berke and Smith 2010). Meanwhile, confidence increases that anthropogenic climate change exacerbates existing threats from natural hazards, particularly floods, droughts, and extreme events like hurricanes (Karl, Thomas, Melillo 2009). In the future, ‘mega-catastrophes’ resulting in billions of dollars in losses may become the norm rather than the exception to the rule (Peacock et al. 2008). In light of the local, state, national and international consequences of growing losses, interest in long-term reductions in risks is strong among practitioners and researchers alike. Long-term risk reduction efforts are known as natural hazard mitigation, which has been defined as “advance action taken to reduce or eliminate the long-term risk to human life and property from natural hazards” (Godschalk et al. 1999 p. 5).

Hazard mitigation plans and implementation of those plans can reduce vulnerability to hazard threats and contribute to a more sustainable and resilient society (Berke and Smith 2010). At the local level, benefits of mitigation plans include consolidating knowledge of the hazards, vulnerabilities and risks faced, building consensus around shared goals and a future-oriented strategy,
and meeting federal requirements to adopt mitigation plans. A less obvious but also important benefit of a hazard mitigation plan is that the planning process can bring together a diverse group of stakeholders that might not work together on mitigation otherwise, or in some cases not work together at all. The process of working together to develop the plan may help those stakeholders build ongoing relationships and be more effective in meeting community goals.

Multiple categories of approaches for mitigating hazards are available to local communities for inclusion in their hazard mitigation plans. Approaches include property protection (e.g. elevating, retrofitting, or acquiring properties), structural controls (e.g. dams, levees and seawalls), public information (e.g. education campaigns), natural resource protection (e.g. preservation of wetlands and dunes) and preventative land use approaches (e.g. zoning and subdivision ordinances). For much of the twentieth century, structural controls were the primary approach, especially for flood management, although they were criticized for providing a false sense of security that induced new development in hazardous areas and damaging natural features that provide inherent hazard mitigation benefits (e.g. wetlands that store flood waters) (Godschalk, Brower and Beatley 1989, Burby et al. 1999, Burby 2006). Non-structural approaches (e.g. land use planning, building codes and public information) began to be more seriously considered in the 1960s and 1970s (Godschalk, Brower and Beatley 1989).

Repeated national level reports and studies have argued that land use approaches provide the best opportunities for reduction or even elimination of long-term hazard risks (Godschalk, Brower and Burby 1989, Burby 1998, Godschalk et al. 1999, Burby et al. 1999, NRC 2006, Berke and Smith 2010). Yet, research has shown local hazard mitigation planning is generally of mediocre quality and integration of land use approaches with hazard mitigation is typically underdeveloped (Berke and French 1994, Burby and Dalton 1994, Berke et al. 1996, Burby and May 1997, Deyle and Smith 1998, Brody 2003, Burby 2003, Tang et al. 2008, Kang et al. 2010, and Berke, Smith and Lyles 2012.) Thus, the overarching motivation for this research is to increase understanding of factors that can lead to greater incorporation of land use approaches into local mitigation efforts.
Scholars have examined the influence of three main groups of factors on quality of local hazard mitigation planning and the incorporation of land use approaches. First, state planning policy context factors include state mandates for local government planning (Berke and French 1994, Berke et al. 1996, Burby and May 1997) and state approaches to intergovernmental enforcement of mandates (Burby and May 1997, Deyle and Smith 1998). Second, local community characteristics include hazard events that create a ‘window of opportunity’ to focus on mitigation (Birkland 1997, 2006, Brody 2009), local political commitment (Prater and Lindell 2000), and socio-economic characteristics and growth pressures (Burby and May 1994, Berke et al. 1996, Brody 2003). Third, characteristics of the planning processes used to develop plans include the diversity of stakeholders involved and efforts to involve the public (Burby 2003 and Godschalk, Brody and Burby 2003).

The national policy context for mitigation has changed dramatically since most of these studies were conducted, however. The Disaster Mitigation Act of 2000 (DMA) attempted to move the country away from its historically reactive and post-disaster federal grant-driven approach to a more proactive planning-oriented approach (Nolon 2009, Smith 2009). A decade after its passage is an opportune time for policy evaluation research to determine whether findings from pre-DMA studies continue to be relevant. Additionally, the existing literature has paid limited attention to the roles of local planners in mitigation planning processes that are typically led by emergency management professionals (Kartez and Faupel 1994, Godschalk 2010, Schwab 2010). Even less attention has been paid to how local planners, emergency managers and other stakeholders work together as an interconnected network. Filling these knowledge gaps is the major purpose of this dissertation. Its findings will contribute to theoretical understanding the influence of local planners and stakeholder networks in planning processes and provide practical knowledge of factors that can lead to more integration of land use approaches into hazard mitigation efforts.

1.2. Hazard Mitigation: A Critical Phase of the Disaster Management Cycle

The standard conceptual model of the cycle of disaster management activities to reduce disaster losses consists of four phases: preparedness, response, recovery, and mitigation (Godschalk,
The preparedness phase primarily deals short-term activities in the period leading up to an expected hazard event (e.g. distributing warning information, evacuating people and pets, and boarding up buildings). The response phase primarily deals with short-term assistance and aid in the period immediately after the event (e.g. search and rescue, debris removal, and restoring basic utility services). Both phases are primarily focused on the short-term safety of people and typically garner the most public attention. Over the last century advances in managing preparedness and response efforts and increased improvements in weather forecasting have led to a downward trend in the loss of life associated with natural hazard events in the United States (Cutter 2001), with the exception of a few major events such as Hurricane Katrina. The success in reducing disaster deaths and injuries stands in stark contrast to the perpetual increases in economic losses described above.

Mitigation offers the primary avenue to counter the trend of economic losses because it is the only phase of the disaster management cycle undertaken well in advance of hazard events (Godschalk et al. 1999). The mitigation and recovery phases of the cycle share a long-term focus on the physical development, or re-development, of a community, but the important distinction is that recovery actions take place in the wake of a disaster event and are fundamentally reactive, whereas mitigation actions can be taken at any time (Godschalk, Brower, and Beatley 1989, Godschalk et al. 1999). A recent study of mitigation costs and benefits between 1993 and 2003 found that for $3.5 billion in mitigation investments, $14 billion in benefits have been realized, resulting in an overall benefit-cost ratio of 4:1 (Multihazard Mitigation Council 2005). The study assessed benefits from project grants that make capital investments in physical structures and process grants in human, social, and institutional capital (including action plans and development of codes and regulations) (Godschalk et al. 2009). The findings indicate that for every dollar invested in process grants the benefit-cost ratio is 1.3 for floods, 1.7 for wind, and 2.5 for earthquakes, although techniques for assessing benefits

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1 As is the case with hazard mitigation, hazard recovery has received less practical and academic attention than the other two phases of the disaster cycle. However, this dissertation focuses on hazard mitigation and will only touch on recovery in isolated instances.
from process grants are less developed and may explain the lower ratios than for project grants, which range from 1.4 (earthquake) to 5.1 (flood).

1.3. Land Use Approaches Can Reduce or Eliminate Hazard Risk

Land use planning (e.g. developing comprehensive plans and administering zoning codes and subdivision ordinances) focuses on managing the physical development of communities’ public and private buildings, infrastructure, and natural resources to advance long-term community visions and goals (Berke, Godschalk and Kaiser 2006). Land use approaches to hazard mitigation reduce or eliminate hazard risk by directing people and property out of hazardous areas into safer locations (Godschalk, Brower and Beatley 1989, Burby 1998, Godschalk et al. 1999). They can help preserve natural features of the landscape that provide mitigation benefits and reduce the need for investment in costly structural controls (Burby 1998, Olshansky and Kartez 1998, Burby et al. 1999, Godschalk et al. 1999). Co-benefits for other community goals can also be gained, such as creating greenspace that serves as a community amenity useful for active and passive recreation (e.g. ball fields and nature trails). Using land use approaches to reduce risk is not without controversy, though, as evidenced by the fact prominent supreme court property rights and takings decisions have dealt with land use and natural hazards (e.g. Lucas v. South Carolina Coastal Council).

Olshansky and Kartez (1998) identify categories of land use management tools useful for mitigation (Table 1.1). A synthesis of multiple studies from the 1980s and 1990s found that among the land use approaches that are used to mitigate three types of hazards (floods, hurricanes and earthquakes) zoning ordinances and subdivision ordinances are most common (Olshansky and Kartez 1998). They also found that many innovative approaches, such as acquisition of development rights and impact taxes, are used infrequently. Altogether, the breadth of the toolkit provides communities considerable flexibility in crafting a robust set of locally-suited approaches to manage development.
Table 1.1. Land Use Policies and Tools and Mitigation Applications

<table>
<thead>
<tr>
<th>Land Use Policy or Tool</th>
<th>Mitigation Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development Regulations (e.g. zoning ordinances and subdivision regulations)</td>
<td>Control the location, type and intensity of development, and can be used to direct development away from highly hazardous areas or to limit the amount of assets at risk in marginally hazardous areas</td>
</tr>
<tr>
<td>Land and Property Acquisition</td>
<td>Purchasing property outright or through easements or development rights to reduce the risk to structures on the property and even return the property to a more natural state with mitigation benefits</td>
</tr>
<tr>
<td>Critical and Public Facilities Policies</td>
<td>Regulating the siting of publicly and privately owned facilities critical to community function (e.g. schools, fire departments, power plants) so that they are out of hazardous areas</td>
</tr>
<tr>
<td>Taxation and Fiscal Policies (e.g. impact fees or tax breaks for reducing development intensity)</td>
<td>Increase the financial connection for property owners between higher risk development decisions and the public costs the development may incur</td>
</tr>
<tr>
<td>Information Dissemination (e.g. real estate disclosure provisions)</td>
<td>Increase public awareness and affect individual and group behavior</td>
</tr>
</tbody>
</table>

1.4. The Federal Hazard Mitigation Policy Context

In 2000, the federal government passed the Disaster Mitigation Act (DMA) requiring all state and local governments to adopt hazard mitigation plans to be eligible for certain types of federal mitigation funding. Specifically, the DMA requires local mitigation plans to include four main components: 1) documentation of the planning process from the creation of the core planning team to adoption of the plan, 2) a risk assessment, consolidating information about the hazards faced and the community’s vulnerabilities and risks from those hazards, 3) a mitigation strategy consisting of the community’s goals and a set of prioritized, future-oriented actions that will be taken to achieve those goals, and 4) a plan maintenance process that describes how the plan will be monitored, evaluated and updated (FEMA 2008). Under the DMA and related FEMA implementation guidance, local governments must update their plans every five years, although local governments may work together on a multi-jurisdictional plan so long as each participating jurisdiction has its own future-oriented
action(s). As of 2007, all 50 states and more than 14,000 local governments have adopted hazard mitigation plans nationally, which constitutes a tremendous investment of time, effort and financial resources (FEMA 2008 cited in Kang et al. 2010). Presumably, a dramatic increase in local attention to hazard mitigation compared to the pre-DMA period.

Prior to passage of the DMA, hazard mitigation was fundamentally reactive and driven by post-disaster mitigation funding because there were no federal requirements for local hazard mitigation planning and the requirements for state mitigation plans only went into effect after a disaster event (Godschalk et al. 1999). DMA-compliant planning offers a major opportunity to shift the approach to mitigation at all government levels to a much more proactive approach driven by the pre-disaster collaboration of local stakeholders grounded in local risks and goals. Yet, neither the DMA nor the FEMA requirements require that any particular category of mitigation approach be included in a local plan’s strategies. Thus, local governments are under no obligation to attempt to reduce hazard risks by adopting new land use policies and tools or strengthening existing ones.²

Recent research on the categories of approach most prevalent in DMA-compliant local mitigation plans for 175 jurisdictions indicates that preventative land use approaches are comparatively underused, as shown in Figure 1.1. (Lyles, Berke and Smith, 2012). On average, local mitigation plans include just 10% (1.0 on a 10.0 scale) of the preventative land use approaches assessed in the study. Further, Figure 1.1. indicates heavy emphasis on emergency services approaches (e.g. purchasing generators and radios), which directly support disaster preparedness and response efforts but may do little to reduce long-term risks. This finding suggests there also may be widespread misconceptions about what types of actions constitute mitigation. These shortcomings in the implementation of the DMA may be due to which stakeholders are involved in local hazard mitigation planning and, importantly which are not.

² State governments can adopt requirements that local mitigation plans include land use approaches, or other types of approaches, in their mitigation strategy although there is no indication that any have done so to date.
1.5. The Roles of Emergency Managers and Local Planners in Mitigation Stakeholder Networks

Local hazard mitigation stakeholder networks consist of the broad range of individuals and organizations that work together to develop and implement a local hazard mitigation plan. In the late 1990s, Mileti and colleagues emphasized the key role hazard mitigation stakeholder networks play in harnessing the wide array of information and resources needed to address the evolving challenges of mitigation (1999). More than a decade later, however, baseline knowledge about who populates disaster management networks, including hazard mitigation stakeholder networks, is very limited (National Academy of Sciences 2009). Particularly, there is little understanding of whether the stakeholders function as a collaborative network sharing information and working together closely (Innes and Booher 2010). By extension, there is little to no understanding of whether variations in
how stakeholders share information and work together influence the inclusion of land use approaches in mitigation plans or success in implementation of specific land use policies or actions.

Disaster management has historically been the responsibility of emergency management professionals at the federal, state and local levels. The Federal Emergency Management Agency (FEMA), now within the U.S. Department of Homeland Security (DHS), has national oversight for all phases of the disaster cycle, including implementation of the DMA. Many states maintain similarly titled emergency management-oriented agencies or departments. Larger counties and municipalities often maintain emergency management agencies with dedicated professional staffs, although in smaller communities emergency management is often one of many responsibilities of an official, such as fire chief. The profession of emergency management evolved out of a Cold War civil defense culture and for many years natural hazards were of secondary concern (National Emergency Management Association 2011.) In their efforts to manage activities related to all phases of the disaster cycle, many of which center on public safety, emergency managers have not necessarily received professional training or gained much experience with land use planning and its inherent focus on long-term patterns of physical development.

Managing physical development of public and private buildings and infrastructure through land use planning is typically a core responsibility of local planners, but their role in the disaster management cycle has not been clearly defined. Local planners are municipal, county, and regional officials with land use orientations by virtue of their educational background, training, agency of employment, or job responsibilities. Their training includes using the toolkit of land use management approaches described above to influence the location, types, intensity, design, quality, and timing of development. Local planners also often bring experience with multiple facets of plan development and implementation (e.g. facilitating public participation, conducting socio-economic, environmental and policy analysis, and building consensus on goals and proposed actions) in addition to the specific land use-related information and skills useful to mitigation planning.
For their part, though, planners may fail to see hazard mitigation as part of their area of responsibility because of a view of it as only a short-term public safety function. Before the DMA was passed, when mitigation planning was done it was often incorporated into comprehensive plans developed through planning processes led by local planners. The quality of pre-DMA mitigation planning was often low to moderate (Berke and French 1994, Berke et al. 1996, Burby and May 1997, Deyle and Smith 1998, Brody 2003). Burby, May and colleagues found state mandates that building local capacity and commitment to mitigation were key factors driving the quality of local mitigation planning (1997). Planning agency commitment was a key factor driving the use of land use approaches for mitigation. A key concern in the pre-DMA context was motivating local planners leading comprehensive planning processes to focus more attention on hazards.

While the DMA explicitly requires public participation in the development of hazard mitigation plans, little is known about who actually participates. In spite of the widespread consensus on the need to incorporate land use approaches into mitigation, the DMA does not require local planner participation and until recently FEMA requirements and recommendations for local mitigation plans did not emphasis planner involvement. The lack of incorporation of land use approaches into hazard mitigation plans shown in Figure 1.1 raises the question of whether local planners are engaged in hazard mitigation networks at all in many jurisdictions.

Further, even if local planners are involved in mitigation stakeholder networks, the strength of their relationships with the emergency managers who lead the planning process may be a critical factor in determining how much consideration land use approaches receive for inclusion in mitigation plans. Research on relationships between emergency managers and local planners has been sparse. Nearly 20 years ago, Kartez and Faupel found moderate to low levels of both traditional cooperation (e.g. participating in a plan development process or in an emergency exercise) and non-traditional cooperation (e.g. sharing information, special expertise, staff time and other resources). However,

3 In 2012 FEMA has been in the process of rewriting its local mitigation planning guidance and drafts made available for public review promote involvement of local planners as central stakeholders. The new guidance should be released in late 2012.
when local planners were asked their views on being closely involved in hazard efforts, they indicated strong support for these types of ways planners can work with emergency managers. Thus, local planners may represent an under-tapped constituency for hazard mitigation efforts. More recently, a case study of mitigation planning in Lee County, FL found that strong, long-standing coordination between planners and emergency managers was a key factor in that county’s successes in integrating land use and mitigation planning efforts (Godschalk 2010). The experience in Lee County points to the critical role that bridging the expertise divide between emergency managers and local planners may play, particularly considering that the public safety director in Lee County has training as a planner and an emergency manager. The compendium of hazard mitigation best practices by the American Planning Association in which the Lee County case is included highlights the need for more integration between emergency managers and local planners (Schwab 2010). Thus, we can conclude limited collaboration is a little studied ongoing problem that appears to persist as a barrier to effective hazards management (Schwab 2010).

1.6 Research Questions

The overarching thesis of this dissertation is that the ability of a hazard mitigation stakeholder network to incorporate land use approaches into mitigation efforts will be affected by the involvement of local planners, their relationships with emergency managers, and their integration into hazard mitigation stakeholder network structures. To explore and test this thesis more specifically, two main research questions are addressed:

1. Does inclusion of local planners in a hazard mitigation stakeholder network lead to greater incorporation of land use approaches in mitigation efforts, when accounting for state planning policy context, local community characteristics, and the diversity of stakeholders involved in the networks?

2. When local planners are included in hazard mitigation stakeholder networks, do differences in how they are involved in the network of the hazard mitigation stakeholders contribute to greater incorporation of land use approaches in mitigation efforts?

This study takes a social network analysis (SNA) approach to understand the role of local planners in hazard mitigation stakeholder networks and the influence of variations in their roles in the networks.
1.7. A Social Network Analysis Approach to Hazard Mitigation Planning

Social network analysis (SNA) approaches explore the attributes of individuals or organizations that are related to each other (Wasserman and Faust 1994, Knoke and Yang 2008). By taking a SNA approach, this dissertation breaks new ground in understanding the broad range of stakeholders engaged in local mitigation, how they work together as a network, and whether variations in the network from place to place result in the use of more land use approaches to hazard mitigation. It pursues questions about if and how local planners and emergency managers work together on mitigation. But it does so in the context of considering the broad range of stakeholders involved in hazard mitigation, such as other government agencies, elected officials, representatives of business and non-profit groups, and the general public.

A social network analysis approach enables drawing on a rich theoretical and applied tradition to analyze two key conceptual dimensions of hazard mitigation stakeholder networks (Wasserman and Faust 1994, Knoke and Yang 2008, Dempwolf and Lyles 2011). First, SNA conceptualizes the composition of the network. It starts by considering the diversity of assets organizations bring to the network. Each organization brings different assets useful to mitigation, such as information, technical skills, and authorities to administer rules or budgets. These assets include three types of skills and resources that may be essential for incorporating land use approaches into mitigation planning: 1) skills and resources related to the mitigation planning process itself (e.g. facilitation, outreach, communications, mediation, and incorporating the hazard mitigation plan into other planning initiatives); 2) those related to regulation-based approaches to mitigation (e.g. developing, administering and modifying development regulations, such as zoning codes and subdivision ordinances); and 3) those related to project-based approaches to mitigation (e.g. distributing funds for projects). Assessing the land use-related assets across all the stakeholders in a hazard mitigation network using SNA enables consideration of whether adequate land use planning capacity is present in the network and sets the stage for assessing if and how the network is set up to leverage those skills and resources.
Second, social network analysis enables conceptualization of the structure of the entire stakeholder network. It explicitly measures the pattern of relationships between individuals in the network that shape opportunities to communicate, collaborate and otherwise work together to develop and implement hazard mitigation plans (Wasserman and Faust 1994, Knoke and Song 2008). Empirical evidence from fields as diverse as physics, sociology, biology and political science demonstrate that network structures can vary widely (Wasserman and Faust 1994, Newman 2003, Jackson 2008, Knoke and Song 2008, Scholz et al. 2008). Network scholars have developed and continue to refine typologies of categories for different structures and are exploring how variations in network structure can lead to advantages (or disadvantages) for important mitigation-related tasks such as sharing information and engaging in joint problem solving (Watts and Strogatz 1998, Newman 2003, Siegel 2010.). In particular, recent studies have investigated how different structural attributes of networks influence individual and collective action in the context of estuarine management, a planning realm that like hazard mitigation involves a wide range of interested stakeholders grappling with public policy decisions consisting of the interaction of economic, social, and environmental issues (Schneider et al. 2003, Scholz et al. 2008; Mandarano 2009).

In regards to hazard mitigation stakeholder networks, two organizations are connected to each other when the organizations share a relationship, such as exchanging hazard-related information used to write the plan, working together to implement a mitigation initiative included in the plan, or regularly meeting to monitor overall implementation of the plan. Depending on the frequency and nature of the connections between two stakeholders, the strength of the relationship can vary. Depending on how many stakeholders are involved in the network and the number, strength and patterns of those connections, the structure of hazard mitigation stakeholder networks can vary widely from county to county. The positions of stakeholders with land use related assets in mitigation networks with different structures may influence the degree to which other stakeholders in the network become aware of and choose to prioritize land use approaches to mitigation, although those relationships have not been examined.
A key line of social network analysis research centers on the different effects of small, dense networks (those networks with lots of redundant connections, or high ‘closure’, within a group of individuals and few connections outside the group) and large, boundary-spanning networks (those networks with lots of connections across groups that bridge ‘structural holes’) (Burt 2001). Along these lines, Schneider and colleagues identify four types of boundaries that can be problematic in public policy contexts if they are not spanned by a network: horizontal boundaries between adjacent governments, vertical boundaries between higher and lower levels of governments, expertise boundaries between professional disciplines, and ideological boundaries between competing interests (Schneider et al. 2003). The expertise boundary between local planners and emergency managers is a critical boundary in the context of hazard mitigation planning under the DMA. The following idealized example illustrates how two different networks structures and related concepts of bridging and bonding ties may have different advantages and disadvantages. While the examples are simplistic and somewhat contrived, they are intended to provide a tangible lattice on which more abstract social network ideas can be overlaid.

First, consider a county facing imminent landfall from a major hurricane. Everyone in the county may see the emergency management director as the most important person because he or she has many bridging ties to a diverse array of organizations that can provide valuable information for protecting public safety. The bridging connections cross governmental and expertise boundaries and might include NOAA’s hurricane center with its hurricane-track predictions, state emergency management officials in contact with Governor’s office about emergency responder support, local public works and utilities officials monitoring on the ground flooding and wind conditions, and so on. In this situation, a network exists in which a core stakeholder organization (i.e. emergency management) attracts almost all of the connections in the network, as shown in the ‘star-shaped’ structure in Figure 1.2. This phenomenon, known as preferential attachment, has been observed in social, physical and a diverse array of other networks (Barbarasi and Albert 1999). Some of the connections with the emergency manager might be tight bonding connections while others are less
tight bridging connections. Yet, the other, non-emergency management organizations would not have strong connections with each other on disaster management issues, which means there are weak connections across expertise boundaries. This type of network can be very efficient for consolidating information and, in turn, in distributing that information, as might happen when the emergency management director authorizes press releases or speaks to the media about voluntary and mandatory evacuations. More lives may be saved, less time may be wasted sitting in evacuation traffic, and downed power lines may be fixed more quickly because of the highly centralized and hierarchical structure of the network.

Figure 1.2. Preferential Attachment

Now, consider the same county years later in a lull period between major disaster events. Every year, the network has gotten together occasionally to go through its hurricane preparedness exercises, receiving updates from the emergency management director about new technologies, policies, and procedures. The meetings might include group discussion of mitigation projects that would be useful to undertake using federal mitigation funds following the next disaster, or even to
complete beforehand should local elected officials have sufficient funds in their budget. However, due to the lack of strong, bonding ties between the stakeholders across expertise boundaries (especially land use and emergency management), the discussion fails to address more sensitive and challenging topics, such as proposing tighter land use restrictions in the face of political opposition due to property rights concerns. Afterwards, the stakeholders leave the training exercise and return to their day-to-day work, considering mitigation in their own organizational stovepipes, if and when they can include it among their other pressing responsibilities. When the next hurricane hits a few years down the road the short term response might be very effective due to extremely efficient information flow, clear procedures, and quick decision making, but the county will likely have similar, or even higher, levels of property damages and economic disruption than before. Little progress will have been made in reducing vulnerability by creating patterns of development that avoid hazardous areas. Clearly, this preferential attachment network structure does not enable the county’s mitigation stakeholders to meet all challenges with the same effectiveness.

An alternative structure might be more effective for changing physical development patterns to fundamentally reduce or eliminate risk. Consider a network with a core of multiple stakeholder organizations with lots of connections to each other and additional connections to clusters of peripheral stakeholders outside the core, as shown in Figure 1.3. This network might be termed a ‘village’ network with small world characteristics wherein distinct clusters of stakeholders have bonding connections with each other and bridging connections that link the clusters (Watts and Strogatz 1998 and Siegel 2010.)
Such a network might be less efficient in consolidating and distributing information in the crisis-like preparedness and response phases of a disaster because information is flowing in many directions at once and there is no central organization responsible for controlling the flow. On the other hand, this network would allow stakeholders to share, debate and refine ideas together in a much more free-flowing and flexible manner that enables them to build familiarity and trust over time. Representatives from a wide array of organizations with very different perspectives and skills might be better able to tackle the difficult problem of strengthening zoning codes and subdivision ordinances to prohibit or reduce development in the floodplain. Similarly, together they might devise a multi-faceted, mutually reinforcing strategy to reduce flood loss in a low-income neighborhood. They might make a joint application for a grant to purchase and demolish contiguous repetitive flood loss properties, rezone the property to open space, and return a stream that had previously been channelized to a more natural flow. The final product might be a park with interpretative displays for
educating the general public about the risks of flooding and the need for stewardship of natural resources and wise land use. Even if such a project could not be funded immediately, it could be envisioned and built into strategic open space plans with the aim of connecting the park to a large network of greenways. Such a project would be emblematic of multi-objective planning that generates co-benefits, which by definition requires incorporating many perspectives to achieve shared goals. Without the bonding connections in the inner core of the network complemented by bridging connections to different types of expertise, such coordination and cooperation seems unlikely. Thus, there are potential advantages over the more star-shaped network structure.

Importantly, the SNA literature has important ties to theories of the public policy process, social capital, and communicative planning (Dempwolf and Lyles 2011). For instance, conceptualizing planning networks as being composed of individuals with a diverse set of assets who relate to each other through interdependent, or structured, patterns of relationships aligns with concepts of the role of networks in collaborative planning process in the planning theory literature (Booher and Innes 2002, Innes and Booher 2010). The specific concepts and theories (e.g. different structures and bridging/bonding connections), as well as the analytical methods, of social network analysis lend themselves very well to enhancing our understanding of whether communicative and collaborative approaches to hazard mitigation planning meet idealized forms in practice (Dempwolf and Lyles 2011).

Finally, deeper understanding of the stakeholder networks can have practical benefits by helping local officials responsible for mitigation understand how to better target outreach efforts as they build their planning teams and involve the public in planning processes. Such understanding might also give federal and state mitigation officials insights useful for modifying requirements for local planning processes and for adjusting federal and state support for local mitigation planning processes. During the research process for this dissertation, FEMA announced its new “Whole Community” approach, which is very much in line with this argument. The Whole Community approach has six strategic themes, including recognizing community capabilities and needs, fostering
relationships with community leaders, building and maintaining partnerships, and leveraging and strengthening social infrastructure, networks and assets (FEMA 2011.) Effective implementation of the Whole Community approach may hinge on network thinking becoming engrained in key mitigation stakeholders.

1.8. Conclusion

Economic losses from natural hazard events continue to mount and there is reason to expect even greater losses over time. In spite of widespread consensus about the central role land use approaches to reduce or eliminate development in hazardous areas should play in hazard mitigation, land use approaches are under-utilized. While myriad factors contribute to the national failure to reduce long-term hazard risks more effectively, a key factor that has received limited attention is the role played by local planners in the networks of local mitigation stakeholders responsible. This dissertation will examine how local planners who usually bring training and experience needed to integrate land use approaches into mitigation have been involved to date and what obstacles might prevent them from becoming more involved in the future.

Failure to further understand the influence of hazard mitigation stakeholder networks will leave researchers and practitioners blind to a promising way out of a seemingly intractable paradox. So long as hazard mitigation under the Disaster Mitigation Act is dominated by emergency management officials trained to focus on short-term preparedness and response activities, those emergency managers will be forced to try and protect larger and larger numbers of people and broader and broader swathes of property in hazardous areas as long-term mitigation approaches are neglected or ignored. Yet, it may be that when local planners are included in hazard mitigation stakeholder networks and develop close working ties with emergency managers and other stakeholders, implementation of land use approaches to hazard mitigation may slowly but surely help stabilize or even reduce the amount of people and property at risk.

Social Network Analysis approaches to understanding hazard mitigation stakeholder networks have the potential to offer important insights that local, state and federal officials can use.
Other major factors have to be considered as well, including the state planning policy context, local community characteristics and the planning process. These factors likely impact, and may be impacted by, features of the mitigation stakeholder network. Thus, in the face of the climate change, it is important to develop a better understanding of whether concerted efforts to foster the development of local hazard mitigation stakeholder networks results in the greater incorporation of land use planning approaches into mitigation efforts.

This dissertation is structured as follows. Chapter 1 has established the motivating problem, identified the research questions, and outlined the research approach that will be taken. Chapter 2 provides the theoretical grounding to explain the influence of the networks of stakeholders involved in hazard mitigation planning processes on land use planning outputs. It draws on the concepts, theories, and empirical findings from the literature on plan evaluation, collaborative and communicative planning, social network analysis, and hazard mitigation. Chapter 3 lays out a conceptual framework that organizes conceptual dimensions according to the relationships that theory suggest should explain variations in hazard mitigation planning outputs. The chapter also details hypotheses that will be tested and how each of the research questions will be answered. Chapter 4, explains the research design and methods used to answer the questions, evaluate the hypotheses and refine the conceptual framework. It describes the two main phases of the study: quantitative regression modeling and qualitative case studies drawing on plan evaluation, surveys, interviews and site visits.

Chapter 5 presents the results of regression models used to test the central hypothesis across three principles of plan quality: fact base, policies, and implementation. Specifying the principles to the incorporation of land use into hazard mitigation plans indicates that plans are stronger 1) when there is a detailed assessment of existing land use capabilities in their fact bases, 2) when land use policies are proposed in the mitigations strategy and 3) when information relevant to implementation of proposed land use actions is included. Chapter 5 also summarizes the patterns of relationships between the independent variables and the incorporation of land use into the three principles of plan
quality in order to illustrate which variables consistently predict the incorporation of land use across principles and which variables do not.

Chapter 6 compares findings across four qualitative case studies of county-level hazard mitigation in Florida and North Carolina. Supplementary appendices provide detailed summaries of each of the four cases. Chapter 7 concludes the dissertation by revisiting the hypotheses, stating the overarching conclusions, and presenting recommendations for future research and policy.

Supplemental information about the research design and methods is provided (Appendix I). The four case studies are Brevard County, FL (Appendix II), Martin County, FL (Appendix III), Onslow County, NC (Appendix IV), and New Hanover County, NC (Appendix V). Supporting data for the case studies (Appendix VI) and the data collection instruments (Appendix VII) and included as well.
Chapter 2

Literature Review

2.1 Introduction

The purpose of this chapter is to provide the theoretical grounding to explain the influence of local planner involvement in hazard mitigation stakeholder networks on land use planning outputs. Hazard mitigation is a planning and policy domain involving a broad network of stakeholders engaged in decision making related to the intersection of economic, social, and environmental issues on short-term and long-term time scales, all of which involves federal, state and local governments. It provides a rich domain for testing and refining planning and public policy theories, as reflected in the relatively large number of studies that have used it as a test bed to understand topics of wider applicability across other planning and public policy domains. These topics have included intergovernmental approaches to planning (e.g. Berke and French 1994, Deyle and Smith 1998, Godschalk et al. 1999, and Berke, Lyles and Smith www.ie.unc.edu/cscd/publications.cfm), public participation (e.g. Godschalk, Brody and Burby 2003), and the role of local politics, organizational capacity, past experience with disasters and other community characteristics in focusing public attention on planning (e.g. Prater and Lindell 2000, Birkland 1997, 2006, and Brody 2009.) Considerably less attention has been paid to if and how the broad network of stakeholders actually work together in planning processes and what impacts those networks have on hazard mitigation efforts.

A few baseline terms used in this dissertation need to be defined: planning outcomes, planning outputs, and planning processes. Planning outcomes are the long-term changes to underlying
conditions of importance to a community, such as environmental, social and economic conditions. Planning outputs are the intermediate planning products and actions, such as plans, agreements, and implementation of plan provisions, which in turn generate changes to the underlying conditions and result in planning outcomes. Planning processes are coordinated activities taken by stakeholders to develop and implement the planning outputs to achieve desired planning outcomes. In this dissertation, planning processes are the efforts of local stakeholders to develop and implement Disaster Mitigation Act-compliant hazard mitigation plans; the planning outputs are the land use-related content of the hazard mitigation plans and implementation of land use-related mitigation actions; and the planning outcomes are the sustainability and resilience of the communities engaged in hazard mitigation efforts. Resilience refers to the ability of the social, economic and environmental systems to absorb the impacts of natural hazard events and recover quickly using adaptive strategies (Peacock et al. 2008), while sustainability refers to communities’ abilities to balance the social, economic and environmental needs of current and future generations in the face of hazard stresses (Godschalk et al. 1999).

The remainder of this chapter unfolds as follows. Section 2.2 outlines two key planning outputs: the quality of plans and the implementation of future-oriented aspects of those plans. Section 2.3 introduces key theories and concepts of social network analysis and their applicability in increasing understanding of planning processes. Section 2.4 lays out the connections between the first two sections in the hazard mitigation context. It reviews the prior literature on drivers of hazard mitigation planning outputs. It also explores how a social network analysis approach can help refine existing understanding of the factors that drive the quality and implementation of hazard mitigation plans. These three sections set the stage for the conceptual framework laid out in Chapter 3.

2.2. Planning Outputs

“Good planning must be distinguishable from bad.” So wrote Alexander and Faludi, who concluded that making such distinctions is “neither obvious or simple” (1989, 127). This brief quote encapsulates a fundamental challenge for the profession – justifying why planning and plans matter.
A rich line of theory and research for planning scholars has sought to address this challenge by identifying, describing, and explaining why different outputs of planning processes matter. By focusing on planners’ fundamental interest in the most obvious output of planning processes – the plan – Baer implicitly anticipates Neuman’s affirmative answer to the question ‘Does planning need the plan?’ (Baer 1997, Neuman 1998).

Plans can embody different concepts, which Baer categorizes as visions, blueprints, land use guides, remedies for specific problems, administrative requirements for federal funds, pragmatic actions, and responses to federal and state mandates (1997). Baer also acknowledges a process-centered view of plans. Hopkins, meanwhile, offers a narrower range of types of plan concepts based on how the plans are used, including plans as an agenda of things to do, a policy serving as an if-then rule, a vision of what could be, a design of a fully worked out outcome, and a strategy laying out considerations that will be taken into account as decision-situations that may be contingent upon one another are encountered (2001). A single plan may fit more than one concept simultaneously, depending on the circumstances of its development and the perspective of those evaluating the plan. This potential for a plan to address different, or even multiple, concepts should be considered by those who evaluate plans because the standards of evaluation may need to vary based on the concept and purpose of the plan.

Multiple typologies of plan evaluation approaches are available to researchers interested in assessing how well a plan addresses one or more of these conceptual functions. Baer distinguishes between four approaches to evaluation: 1) plan critique, which he likens to a book or movie review by someone other than the plan’s author(s), 2) plan testing and evaluation conducted by the planning team to weigh alternative approaches to achieve the plan goals, 3) comparative research and professional evaluation conducted by a researcher after the plan is developed using a thorough methodology, and 4) post hoc evaluation of plan outcomes, which includes a broad range of possible
evaluations of if and how a plan is implemented.¹ Talen and Hopkins offer similar though not identical typologies of plan evaluation.² This dissertation focuses on Baer’s third and fourth types of evaluation: evaluation of the content of the plan (referred to here as plan quality evaluation) and evaluation of if and how the plan is implemented (referred to here as plan implementation evaluation).

2.2.a Plan Quality Evaluation

The plan quality evaluation approach has been used to describe planning outputs and, to varying degrees, empirically test both the influences on and the influences of specific outputs (Baer 1997 and Berke and Godschalk 2009). It is the oldest and arguably the most prevalent and methodologically thorough of the plan evaluation approaches (Baer 1997). Studies adopting this approach focus on the quality of plans; that is, the quality of the words, charts, tables, maps and other content in the paper or digital plan document (Baer 1997, Berke and Godschalk 2009). They treat the plan itself or the jurisdiction that adopts the plan as the unit of analysis. The plan quality approach has evolved since the 1970s and has seen increasing agreement among scholars on the core theoretical principles of quality and the content analysis methods to measure quality (Baer 1997, Berke and Godschalk 2009, Berke, Smith and Lyles 2012).

Plan quality researchers continually strive to identify more clearly the constructs about which they wish to make judgments or distinctions about a plan’s content. Scholars have proposed a wide variety of criteria for evaluating different components of plans based on varied conceptual dimensions

¹ He also includes plan assessment, but does not include a description of this approach.

² Talen categorizes evaluation into four main approaches. First is evaluation prior to plan implementation, including evaluation of alternative plans and analysis of planning documents. Second is evaluation of planning practice, including studies of planning behavior and descriptions of the impacts of planning and plans. Third is policy implementation analysis. Fourth is evaluation of the implementation of plans, which she divides into nonquantitative and quantitative approaches (1996a). Hopkins focuses on four questions that can be applied to any of the five types of plans (i.e. agenda, policy, vision, strategy and design) (2001). He argues for assessing four broad criteria (noted by italics added here for emphasis): 1) “did the plan have any effect on decision making, actions or outcomes;” 2) “Was the plan worth making and for whom?” (net benefit); 3) “Did the plan fulfill the logic of how it was intended to work? (internal validity); and 4) Did the outcomes intended or implied in the plan meet external criteria, such as claims for a just society? (external validity) (Hopkins 2001, 46-47).
of interest and the specific context of the plans being studied (Baer 1997, Berke, Godschalk and Kaiser 2006, Berke and Godschalk 2009). A degree of consensus has emerged about key first-order characteristics, or principles, which can be used to represent multiple conceptual dimensions of plan quality. These principles are considered to be universal and can be applied across multiple contextual domains (e.g. comprehensive planning, transportation planning, hazard mitigation planning, etc.). Some studies have combined these principles to provide an assessment of overall plan quality (e.g. Berke et al. 1996, Brody 2003).

A recently proposed intuitive categorization of these principles distinguishes between direction setting principles and action-oriented principles, as shown in Table 2.1 (Berke, Smith, Lyles and Reynolds 2011). Direction setting is understood to provide the normative and factual basis for plan making, monitoring and evaluation (modified from Berke, Godschalk and Kaiser 2006). Action-oriented principles relate to the individual and collective actions taken to develop, implement, monitor, and update the plan. While conceptually distinct, the principles are interdependent and an effective plan will be strong on each principle (Berke, Smith and Lyles 2012). Failure to adequately address one or more principles can undermine a plan that has high quality otherwise.

Table 2.1: Direction Setting and Action Oriented Plan Quality Principles

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<tr>
<th>Direction Setting Plan Quality Principles</th>
<th>Action Oriented Plan Quality Principles</th>
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<tr>
<td>Vision and Goals</td>
<td>Implementation</td>
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<tr>
<td>Fact Base</td>
<td>Inter-organizational coordination</td>
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<tr>
<td>Policies (proposed actions)</td>
<td>Participation</td>
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<td></td>
<td>Monitoring</td>
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Plan quality evaluation studies have explored the influence of a number of different factors on plan quality. The broad categories of factors explored include: federal and state influences on local planning (e.g. regulatory requirements and enforcement style), aspects of the planning process (e.g. public participation) and local community context (e.g. population, wealth and domain-specific factors such as experience with recent disaster events). The influences of these factors on hazard mitigation plan quality are reviewed in detail in Section 2.4.
2.2 Plan Implementation Evaluation

Plan implementation evaluation focuses on if and how the policies and actions included in a plan are adopted, carried out or otherwise implemented. Since Pressman and Wildavsky’s (1973) book *Implementation,* considerable attention in the fields of public policy and planning has been paid to what happens once policies or plans have been adopted, although empirical work in planning is still somewhat limited. The plan implementation literature is less developed at this point than the plan quality evaluation literature and exhibits less convergence towards theoretical or methodological consensus. Nonetheless, the following studies provide a foundation upon which to build.

Alexander and Faludi offer a continuum of approaches to planning that result in different implementation evaluation criteria for different segments of the continuum (1989). First, planning can be understood as ‘conformance,’ that is, planning as attempting to control the future, in which plans not implemented are considered failures. Second, planning can be understood as a decision making process under conditions of uncertainty, in which implementation becomes irrelevant because the evaluation criteria are oriented to the process of developing the plan. Third, in the middle ground “implementation is still important but where, as long as outcomes are beneficial, departures from plans are viewed with equanimity” (p. 127). Mastop and Faludi offer plan performance as another criterion for plan implementation evaluation (1997). Performance refers to “whether the plan plays a role in those decision situations in which it was meant to be used” (Mastop and Faludi 1997, 820).

Empirical applications of these approaches have been undertaken by a few planning scholars. Talen argues for taking a conformance approach to assess whether plan objectives have been met and she outlines different methods for assessing the impact of plans on actual development patterns, such as park location (Talen 1996a, 1996b). Burby and May (1997) take the conformance approach in explaining the adoption (or lack thereof) of development management techniques in line with comprehensive plan policies. They and their colleagues find that plans positively influence adoption of land use strategies to address hazards and, when coupled with local official commitment to mitigation, result in a mix of strategies, including land use approaches. Burby (2003) used interviews...
with planning staff to generate implementation success ratios, defined as the proportion of policy measures included in the plan that were implemented to the proportion of policy measures not implemented, as a measure of whether actions proposed in plans had been implemented. He found that greater stakeholder involvement led to higher levels of implementation, as well as higher plan quality. Berke and colleagues applied conformance and performance criteria to inclusion of storm-water management techniques in developments permits in New Zealand (Berke et al. 2006). Key findings included that overall conformance and performance were both weak and that implementation conformance was a function of a wider array of planning agencies activities and capabilities than performance, which was primarily influenced by the enforcement style.

Hopkins provides a sophisticated and flexible conceptual approach focused on how plans are actually used, which is more closely related to the performance approach than the conformance approach (2001). He emphasizes that how the criteria are applied depends on which of the five ways a plan works (i.e. as an agenda, vision, policy, design or strategy). Plan use has been evaluated, although not as comprehensively as set forth by Hopkins. Norton (2005a and 2005b) measured plan use as the “extent to which the plan played a role in guiding local officials’ land use–related public policy decision making (ordinance adoption, site-specific ordinance revision, capital improvement policies—focusing primarily on ordinance adoption) (2005b, p. 154). Interestingly, Norton found the key factors enhancing plan use by elected officials were public engagement in the community and the commitment of local elected officials to planning. Notably, plan quality was not influential on plan use, although Norton suggests additional research to address concerns the finding is an artifact of the variables and conceptual framework.

2.3 Social Network Approaches

Taking a social network analysis (SNA) approach to understanding planning processes may help fill in the gap in knowledge about the influence of planning processes on planning outputs. The five parts to this section 1) present basic features of social network analysis applicable across the

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3 The four criteria are 1) effect, 2) net benefit, 3) internal validity, and 4) external validity.
social sciences, 2) connect social network analysis to planning theories of communication and collaboration, 3) review applications of SNA in planning, 4) review applications of SNA in planning-related disciplines and 5) review applications of SNA in the specific policy domains of hazards and disasters. A recent literature review in the *Journal of Planning Literature* by Dempwolf and Lyles (2011) covers many of the issues covered in this section in more detail.

2.3.a. Social Network Analysis

Social network analysis consists of theories and concepts, as well as descriptive and analytical methods, to understand relations between actors and the influence of those relations on actors (Wasserman and Faust 1994, Knocke and Yang 2008). It departs from a conception of individual stakeholders whose actions are primarily driven by their own attributes and who pay little heed to the behaviors of other stakeholders (Knoke and Yang 2008). Instead, as Knoke and Yang summarize:

“network analysis explicitly assumes that actors participate in social systems connecting them to other actors, whose relations comprise important influences on one another’s behaviors. Central to the theoretical and methodological agenda of network analysis is identifying, measuring, and testing hypotheses about the structural forms and substantive contents of relations among actors” (2008 p. 4).

In social network analysis, ‘actors’ can refer to individuals, such as stakeholders, but it can also refer to organizations that relate to each other. ‘Stakeholders’ is used in place of ‘actors’ from here forward.

A fundamental distinction in social network analysis is between *network composition* variables and *network structure* variables. Network composition variables are attributes of individual stakeholders and correspond to standard social science variables (e.g. race, gender and ethnicity) (Wasserman and Faust 1994). Network structure variables are measured on pairs of stakeholders and are the ‘relational’ aspect of network analysis (Wasserman and Faust 1994). Relational ties measured on pairs of stakeholders can be aggregated to enable analysis of the patterns of relationships across many (or all) stakeholders in a network. Together, network composition and network structure variables can be used to assess ways network structure enables or constrains stakeholders’ ability to
jointly leverage their attributes in planning processes. This ability to bring a relational perspective to traditional social science research is a major factor in the exponential increase in published papers noting ‘social networks’ as a key concept (Knoke and Yang 2008).

Social Network Analysis provides a number of theories and concepts useful for policy and planning analysis. These theories and concepts can be applied at multiple levels of networks, including at the level of individual stakeholders (e.g. the power or influence associated with central positions in a network), pairs of stakeholders (e.g. the influence of strong versus weak ties between stakeholders), groups of stakeholders (e.g. clustering of stakeholders within the network), and the full network of stakeholders (e.g. how the overall structure of the network enables or constrains individual and group action). Conceptual typologies that have been used to develop theories and hypotheses of the influence of social networks include 1) the structures of whole networks, 2) the ties between stakeholders, and 3) the positions of individual stakeholders within a network.

The number of stakeholders in a network and the number of ties between the stakeholders can range from just a few in number to millions and as a result network structures can take on a nearly infinite range of topologies, or structures. Barabasi and Albert attribute the commonly observed scale-free power-law properties\(^4\) of many networks to the fact most network are open and add new stakeholders over time and the connections in the network exhibit preferential attachment (1999). The implication of this finding is many types of networks, including social, information and biophysical networks, self-organize such that the “rich-get-richer phenomenon” is present and a few stakeholders are highly connected and central to the network while most are less well connected and peripheral. A “star-shaped” network is a simple manifestation of preferential attachment useful for understanding its implications (see figure 1.1 in Chapter 1, for example). Preferential attachment networks can provide highly efficient information consolidation and distribution because one central

\(^4\) That is, the distribution of the number of other stakeholders that each stakeholder in the network is connected to (i.e. the degree distribution) follows a power law distribution, which results in a few stakeholders with many connections and many stakeholders having few connections.
stakeholder can reach all the other stakeholders through just one connection (Gould 1993, Berardo and Scholz 2010). However, a star-shaped network limits the ability of non-central stakeholders to share information with each other directly, work together face-to-face, and otherwise in engage in joint problem solving without filtering and control by the central stakeholder, whose capabilities may be overloaded or whose motives may not be in line with other stakeholders. Additionally, a star-shaped network is vulnerable to loss of the central stakeholder and to the power of the central stakeholder to control flows in the network (Berado and Scholz 2010).

Another network topology common in many social, information, and biophysical self-organizing networks is the “small-world” network (Watts and Strogatz 1998). Small-world networks are characterized by tight connections between stakeholders close to each other in the network, referred to as high clustering, but also by enough connections from across clusters to result in short average paths between stakeholders in the network. The properties of high clustering and short path lengths foster an attractive balance of numerous connections within subsets of stakeholders and maintenance of efficient overall connectivity.

Siegel builds on preferential attachment, small world, and other network concepts to develop a qualitative typology of four idealized network structures intentionally designed to be useful in situations with rich or sparse network data (2010) (See Figures 2.1, 2.2, 2.3 and 2.4). The first type, a “small-world” network, is taken directly from Watts and Strogatz, though Siegel elaborates on the concept by likening a small-world network to modern cities and dense suburbs “in which there are no exceptional citizens who hold an inordinate amount of sway over their peers” (2010, page 131.) Second, “village” networks are similar to small-world networks but the stakeholders are more tightly clustered, such as one might expect in a “small towns, villages, and cliques, in which everyone knows everyone else within the social unit, and all exert equal influence on each other” (2010, page 131.) In these first two types of networks, most stakeholders have comparable numbers of connections and,

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5 Gould (1993) modeled the influence of network size, density and structure on behavior imitation in collective action situations (e.g. neighbors opting to pick up trash on their street as a function of other neighbors opting to pick up trash).
generally speaking, comparable influence. In the third and fourth types of networks there are elite stakeholders with many more connections than most stakeholders and, generally speaking, more influence. “Opinion leader” networks are star-networks (and more complicated forms) with a few elite stakeholders gaining influence by monopolizing most of the connections. In the fourth type of networks, “hierarchical” networks, the elite stakeholders gain power by virtue of being at the top of a series of levels of stakeholders.  

Based on simulations Siegel found that when elite stakeholders in opinion leader networks are motivated (or, conversely not motivated) to promote a behavior (e.g. participation, voting, etc.) then other stakeholders tend to exhibit that behavior (or, conversely, not exhibit the behavior). This argument builds directly on the concept of preferential attachment and the potential positive and

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6 For example, one elite stakeholder at the top (first level) may have four connections to second-level stakeholders, who have no or limited connections with each other. In turn each of the second-level stakeholders have four connections to third-level stakeholders and so on.
negative consequences of star-shaped networks described above. Second, small-world networks can facilitate the spread of behaviors through a balanced combination of strong ties (e.g. within clusters that can exert peer pressure to support a behavior) and weak ties (e.g. between clusters that can spread awareness of a behavior). This argument builds on Granovetter’s theory of the strength of weak ties, which holds that weak ties (i.e. ties that are less frequently used or less intense) are often more useful than strong ties (i.e. ties that are more frequently used or more intense) because strong ties tend to occur among stakeholders with similar (i.e. redundant) connections, information, beliefs and other attributes, while weak ties often provide access to novel (i.e. potentially innovative) connections, information, beliefs and other attributes (1973).

Two concepts useful for reinforcing the understandings drawn from network typologies are the concepts of bonding and bridging social capital. Bonding concepts – for example the ‘closure’ argument associated with Coleman – emphasize that densely connected networks facilitate trust and agreement among individuals (Burt 2001). By focusing on dense connections, the closure argument emphasizes the importance of networks in which stakeholders are highly interconnected and can observe one another easily, which in turn can reduce the risk for stakeholders to trust each other because of the low cost of sanctioning stakeholders who violate expected norms. Bonding connections arise through clustering of stakeholders who typically share key attributes. On the other hand, bridging concepts – such as Granovetter’s strength of weak ties and the ‘structural holes argument’ associated with Burt – emphasize that links between two groups within a network that are otherwise unlinked provides access to a broader range of information (Burt 2001). By focusing on connections spanning boundaries between groups of stakeholders, the bridging argument emphasizes the importance of networks that have access to stakeholders with diverse attributes, which can increase access to new information, ideas, skills and other assets needed for creativity and problem solving. The two concepts of bonding and bridging connections are not mutually exclusive and networks with a densely connected core and with numerous non-redundant, boundary-spanning connections, such as small-world networks, may be the highest performing networks (Burt 2001).
Another important set of network concepts relates to the relative positions of individual stakeholders in a network. More specifically, network centrality refers to the prominence of an individual stakeholder in the context of all the other connections between stakeholders in the network (Knoke and Yang 2008). Two main concepts of centrality are relevant here: degree centrality and betweenness centrality.\(^7\) Degree centrality focuses on the number of connections to other stakeholders a stakeholder has, with more connections associated with higher degree centrality. High degree centrality may provide a stakeholder access to a wide array of information and potential partners, but also may require a great deal of effort to maintain (Scholz et al. 2008). Betweenness centrality focuses on whether a stakeholder serves as an intermediary, or broker, between other stakeholders (Freeman 1978, Knoke and Yang 2008). It measures whether a stakeholder is on the shortest path between two other stakeholders in the network. Stakeholders with high betweenness centrality may exert considerable influence on the flow of information in a network and may provide important bridging connections.

2.3.b. Communication, Collaboration and Networks


To gain a sense of network-oriented concepts in the early thinking of communicative and collaborative planning theorists, we can look to one of the early works in the area, Planning in the

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\(^7\) A third centrality concept is closeness centrality, which focuses on how close a stakeholder is to other stakeholders in the network, which is a function of the distance between stakeholders. One can think of the child’s game telephone, wherein the more kids that a message has to pass through (lower closeness) the less likely the kids will be effective in transmitting the message.
Face of Power, by John Forester. Planning’s aim to guide future action in the face of uncertainty has led to mistaken views that it is either technical problem solving or nitty-gritty political action (Forester 1989). In line with the concept of network composition, Forester frames planning processes as involving a wide range of stakeholders with “conflicting interests and great inequalities of status and resources” (1989, p. 3). Planners are unable to take on a uniform, neutral role in all situations and, instead as a stakeholder in the network they must make decisions about how they want to engage with other stakeholders (e.g. through regulation, shuttle diplomacy, etc) (Forester 1989).

Forester’s descriptions of the role of planners in planning processes align with the concept of network structure. He emphasizes that the daily activities planners engage in center on communication with other stakeholders, which can be constrained by multiple forms of distortion (Forester 1989). Forester argues central tasks for planners are to engage in critical listening to understand sources of power imbalances that are perpetuated by communicative distortions and to work to shape the attention of other stakeholders in order to combat power imbalances. When communication ties are present between stakeholders, bonding ties can increase the trust necessary to reduce distortions and bridging connections can increase the range of perspectives being considered. Planning processes are also understood as group search processes, characterized by conversation, learning, and making sense together with other stakeholders. Planners with high levels of centrality in the network, especially betweenness centrality, can exert more influence on the shaping of stakeholders’ attention to key issues and problems.

Innes and Booher’s Planning with Complexity (2010) provides a companion bookend to the last few decades of communicative and collaborative planning literature. Innes and Booher argue a

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8 The four types of distortion are: 1) cognitive limits that are socially ad hoc, but inevitable (e.g. in line with Simon), 2) differentiation that is socially systematic, but inevitable (e.g. in line with Weber), 3) pluralist bargaining that is socially ad hoc and socially unnecessary (e.g. in line with Lindblom) and 4) structural legitimation that is socially systematic and socially unnecessary (e.g. in line with Marx) (Forester 1993).

9 A central goal of these planning processes is to develop mutual understanding, characterized by four criteria drawn from critical theory: comprehensibility (i.e. ability to understand each other’s language), accuracy (e.g. shared understanding of factual claims), legitimacy (i.e. shared recognition of the right to expression) and sincerity (e.g. shared understanding of the expressive intent) (Forester 1989 and 1993).
planning process is collaboratively rational if “all the affected interests jointly engage in face to face dialogue, bringing their various perspectives to the table to deliberate on the problems they face together” (2010, p. 6). Central to this notion of collaborative rationality is a broad understanding of information as including not only traditional technical, formal and scientific information, but also stakeholders’ own experience, stories stakeholders tell, the images and languages used in those stories to frame problems and actions, and, finally, stakeholders’ individual intuition of the planning situation (Innes 1998). Their basic argument is that collaborative planning processes (i.e. those that generate collaborative rationality) will generate not only effective solutions to shared problems, “but also individual and collective learning that will help make the community more adaptive and resilient” (2010 p. 9). This learning can in turn lead to changes making the governance system itself more adaptive and resilient.

Central to Innes and Booher’s arguments is explicit attention to the concept of networks, which they identify as the “core of adaptive governance,” (2010, p. 208). Booher and Innes (2002) defined network power as “the shared ability of linked agents to alter their environment in ways advantageous to these agents individually and collectively” (2002, p. 225). They developed a theory to outline the conditions needed for collaborative rationality and the development of network power (Innes and Booher 2010, Booher and Innes 2002). The theory describes two sets of characteristics of stakeholders that are the starting conditions: diversity of interests and interdependence of interests (2010, p. 35). Aligning very closely with the concept of network composition, diversity of interests refers to the need for more than just the powerful or elite in planning processes. They argue that

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10 Hanna (2000) provides cautionary evidence that participation in a planning process and access to information are not synonymous and that broad access to information to stakeholders is required for planning processes striving for consensus.

11 They term it the DIAD theory (Innes and Booher 2010). The two sets of stakeholder conditions (the Diversity, or D, and the Interdependence, or I) set the stage for authentic dialogue (the ‘AD’ of DIAD). Authentic dialogue is characterized by the four ideal conditions of comprehensibility, accuracy, legitimacy and sincerity, the same conditions from critical theory identified by Forester in 1989.
“[t]here must be many values, interests, skills, and types and sources of knowledge in the process for robust ideas to develop and for the system to build a capacity to develop over time” (page 36).

Interdependence of interests means stakeholders’ interests must be interdependent so that all stakeholders have motivation to remain engaged in the planning process (Innes and Booher 2010). Interdependence “helps assure that participants will maintain the interest and energy to engage with each other throughout the process and have the incentive to reach agreement” (page 36). This concept of interdependence is inherently relational with the ties between stakeholders consisting of various forms of dependence on each other to achieve their individual interests. Innes and Booher argue that collaborative planning processes can lead to two types of planning outputs. They can generate tangible benefits, such as the plans, policies and other agreements that arise from the planning processes and, they can create intangible benefits, such as shared identities, shared meanings, innovation and other beneficial adaptations to the system over time.

2.3.c. Social Network Analysis Applications in Planning

While ideas about networks are central to influential theories of planning scholars such as Forester and Innes, the theories, concepts and tools offered by Social Network Analysis have received limited attention. This point is illustrated by the 2003 Joint Conference of the Association of Collegiate Schools of Planning and the Association of European Schools of Planning, as summarized in a text, The Network Society: A New Context for Planning, consisting of 18 papers by planning scholars, including prominent planning theorists, on whether networks are a new paradigm for planning (Albrechts and Mandelbaum 2005). Two of the papers conclude that more information is needed, particularly from related disciplines (Innes 2005, Fainstein 2005). Fainstein critiques ‘network analysis’ as a fuzzy concept, yet not one of the eighteen papers in the book specifically mentions the field of social network analysis (SNA), which suggests that network analysis may not

12 In addition to the communicative planning theory literature and its antecedents in critical theory, Innes and Booher ground their concept of interdependence on the broader literatures of rationality, negotiation and dispute resolution, and complexity science, including the works of Axelrod (1984), Ostrom (1990), Fisher and Ury (1981), Gleick (1987).
necessarily be ill-defined so much as planning scholars are still learning about it and its applicability to planning.

Since the publication of *The Network Society* planning scholars have drawn on SNA to grapple with planning problems, but only to a limited degree (Dempwolf and Lyles 2011). Planning-related applications fall into three main types: 1) using SNA to understand spatial and social dimensions of ‘community,’ which have tended to focus on the structure of networks, 2) using SNA to understand public participation and the outcomes of planning process, which have tended to focus on flows of information across network structures, and 3) using SNA in specific subfields of planning (2011). The studies have exhibited a general progression from theoretical approaches to empirical approaches over time.

Studies applying social network analysis to public participation show how SNA can improve our theoretical understanding of collaborative planning processes and help practicing planners become more reflective and strategic about their network. Doak and Parker (2002) present theoretical arguments for ‘pre-plan mapping’ of the stakeholder network to determine the ‘power geometry,’ particularly in regards to the position and role of the planner. They draw on critiques of a gap between rich theories of communicative and collaborative planning and the lack of practical guidance for putting such theories into practice. Taking a ‘neo-pragmatic’ approach, they emphasize using network analysis to identify the resources embedded in a network and the extent, shape and quality of the network, the ‘network topology’ (2002, p. 9). Subsequent studies present more “how-to” approaches in order to benefit individual communities engaged in planning efforts (Provan, Veasey and Staten 2005, Krebs and Holley 2006, Prell, Hubacek and Reed 2009). For example, planners can proactively gather information about their local network (e.g. through surveys) to understand who is central to the network, who has been or is under-represented, and who brings bridging connections (Provan, Veasey and Staten 2005 and Prell, Hubacek and Reed 2009). These types of information and analyses can help planners engage in “network weaving” by fostering relationships in a targeted manner to strengthen the network (Krebs and Holley 2006). An earlier unpublished dissertation used
SNA to examine whether the structure of communication networks in human service delivery is associated with citizen influence in the planning process, which was found to be the case (Gaunt 1994).

Mandarano demonstrates the usefulness of social network analysis by exploring the development of shared social capital through a National Estuary Program collaborative planning process (Mandarano 2009). Quantitative and qualitative social network analysis techniques allowed for richer insights into the stakeholders’ interests than traditional tabulations would. Social network analysis of exchanges of resource and funding embedded in the network of stakeholders enabled analysis beyond the convergence and divergence of stakeholder interests. Understanding gaps in sharing of resource and funding between stakeholders pointed to bridges that need to be fostered for more effective collaboration. Finally, she found the National Estuary Program policy fostered not only trust and cooperative attitudes, but also it was “successful at establishing a collaborative process through which its participants formed new relationships – the infrastructure of social capital” (2009, p. 258.) Mandarano focused on a single estuary planning process, which precludes comparative analysis; however her work points to the potential benefits of applying social network analysis to understand collaborative planning processes engaging a diverse range of stakeholders across multiple levels of government.

2.3.d. Social Network Analysis in Planning-Related Disciplines

Public policy, political science, public management, and other planning-related disciplines increasingly employ SNA theories and techniques to examine the role of individual stakeholders and stakeholder networks in policy domains (Thatcher 1998, Berry et al. 2004, Adam and Kreisi 2007, Heaney and McClurg 2009). SNA approaches have grown from interest in inter-organizational theory stressing interdependence of actors and interest groups and agenda setting (Adam and Kreisi 2007). As Adam and Kreisi argue, “[t]he image of a policy network represents an intuitively comprehensible metaphor: communication and frequent exchange of information lead to the establishment of stable relationships between actors and to the coordination of their mutual interests”
SNA approaches can be used to help test and refine theoretical frameworks such as the Institutional Analysis and Development framework developed by Ostrom and colleagues, though using a SNA approach needs to complement rather than confuse or rival the other theoretical approaches and methods with which it is used (Thatcher 1998 and Adam and Kreisi 2007). Heaney and McClurg argue that SNA is most valuable in the political context for understanding problems involving 1) coordination, cooperation and trust, 2) informal organizations, 3) multiple levels of governance and 4) flows of information (2009). Dempwolf and Lyles (2011) explain how each of these types of problems impact planning processes and how SNA can be useful in understanding the problems and how they are overcome in planning situations, while also raising two other problems that SNA can help planners address: 5) sources, uses and exercise of power and 6) dynamic networks.

Empirical papers have use SNA to evaluate policy networks that, like hazard mitigation networks, often grapple with issues that cross disciplines and political boundaries. Three papers using the same dataset offer insights for understanding bonding and bridging connections and the role of overall network structure. First, Schneider and colleagues assessed boundaries that need to be bridged in governance situations requiring public and private organizations cooperating on policy action across traditional government boundaries (2003). Their particular focus is on comparing stakeholder networks in areas supported by National Estuary Program (NEP) and those not supported by the NEP. They argue networks “enhance the likelihood and scope of policy agreements by increasing available information about potential agreements and enhancing the credibility of commitments to fulfill the agreements,” providing an alternative to top-down hierarchical governance (2003, page 144). But, they also argue the networks are under-supplied because developing and maintaining a network can impose high costs while benefits do not necessarily accrue to the individual stakeholders. Of particular relevance is Schneider and colleagues typology of four

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13 Papers in this same vein include the work of Scholz and Wang on enforcement and compliance rates for the Clean Water Act (2006), Lubell, Henry and McCoy on regional land use and transportation planning in California (2010), and Weible and Sabatier on marine protected areas in California (2005).
boundaries creating barriers to policy action within local policy contexts, boundaries networks can
bridge: vertical, horizontal, expertise and ideological (Table 2.2).\textsuperscript{14} The need to bridge each of these
boundaries fits with the concerns communicative planning and alternative dispute resolution scholars
have expressed about traditional top-down hierarchical governance approaches (Innes and Booher
2010, Susskind et al. 1999).

**Table 2.2 Boundaries in Governance Networks**

<table>
<thead>
<tr>
<th>Boundary</th>
<th>Situation and Implications</th>
</tr>
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<tbody>
<tr>
<td>Vertical</td>
<td>Exists when levels of government, from local to regional to state to federal governments are not connected and can result in actions taken at different levels of government working in opposition to each other.</td>
</tr>
<tr>
<td>Horizontal</td>
<td>Exists when local jurisdictions in an area with a shared geographic boundary are not connected and can inhibit their ability to join resources to address shared problems and lead to local government actions taking actions detrimental to neighboring communities.</td>
</tr>
<tr>
<td>Expertise</td>
<td>Exists when policy experts with important policy information and expertise are not connected and increases the likelihood that problems are misunderstood or the possible range of actions considered is inadequate or inappropriate.</td>
</tr>
<tr>
<td>Ideological</td>
<td>Exists when competing interests do not interact directly and seek consensus and instead rely on more adversarial policy arenas to resolve conflict.</td>
</tr>
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</table>

(Based on Schneider et al. 2003)

Second, Scholz and colleagues seek to explain the different impacts of bonding-oriented networks and bridging-oriented networks on resolving collective action problems (Scholz et al. 2008). Arguments that small, dense, bonding-oriented networks are hypothesized to ‘enhance credible commitments’ because they provide higher levels of familiarity and trust among stakeholders are contrasted with a competing hypothesis that large, boundary-spanning, bridging-oriented networks ‘enhance search and information exchange’ because they provide access to a wide array of information, perspectives, and potential collaborators. To test these competing hypotheses, they use the concepts of network density, degree centrality and betweenness centrality. They find that

\textsuperscript{14} Schneider and colleagues seek to explain the influence of the National Estuary Program on the networks; that is, they treat networks as the dependent variable and seek to understand if and how government policy and help build stronger networks (2003).
stakeholders centrally-located in large, boundary-spanning networks engage in more collaboration than do stakeholders in small, dense networks. On the other hand, stakeholders in small, dense networks perceive more agreement among stakeholders and the authors argue that positions in small, dense networks may be sought by stakeholders “less motivated to resolve policy problems at the estuary level” (2008, page 404). These findings suggest that inadequate boundary spanning is a more relevant barrier to collaborative governance in estuary management than is lack of familiarity and trust among stakeholders (Scholz et al. 2008).

Third, Berado and Scholz refine the analysis of the role of bridging and bonding connections in collaborative processes in the context of estuary management networks, which were new policy arenas in the regions studied (2010). Almost all of the networks had a central stakeholder and many peripheral stakeholders, in line with preferential attachment. The implication is that in a newly formed policy network connections are initially formed with ‘popular’ stakeholders with many ties that can serve as central coordinators for estuary management. Stakeholders seek to increase their bridging connections to “discover collaborative possibilities and resolve relatively simple, low-risk dilemmas” (2010, page 644). Also, stakeholders “seek reciprocal relationships to provide credibility for smaller projects and quickly learn to trust or distrust those they rely on” (2010, page 644-5). The trust they develop may provide the foundation to take on larger projects that require higher levels of commitment from other stakeholders.

2.2.e. SNA in The Hazard and Disaster Management Policy Domain

Use of SNA in the policy domain of hazard and disaster management is limited. A National Academy of Sciences (NAS) report summarizing a recent NAS workshop titled “Applications of Social Network Analysis for Building Community Disaster Resilience” addresses this topic (2009). The report notes that “[t]he adoption of SNA has the potential to revolutionize the way organizations and communities function in general, and prepare and respond to disaster in particular” (2009, page 3). Two key themes in the report inform this dissertation research. First, researchers and practitioners emphasized more baseline data is needed about formal, governmental networks
responsible for disaster management and how those networks integrate with other social networks. Likewise, the skills and other attributes of stakeholders in the networks need to be better understood.

Second, the report notes that “[p]lanning is often done within the constraints of top-down policies that focus on protection and response rather than mitigation, and few incentives exist for communities to work toward resiliency” (2009, page 43). It notes “SNA could be used to understand how communities organized around hazards and how people and organizations use network during disasters” (2009, page 44.) Much of the existing work in hazards and disaster management using SNA focuses on the preparedness and responses phases of the disaster management cycle, particularly communication among emergency responders in the aftermath of events such as 9-11 and Hurricane Katrina. For example, Lind and colleagues’ examination of emergent multi-organizational networks (EMONs) in the wake of Hurricane Katrina “suggest important limits to the type of ‘swift trust’ that can form during a disaster, and suggest the potential utility of pre-disaster network surveys as a mechanism for identifying and rectifying problematic structural holes (Burt 1992) as part of communities’ ongoing mitigation and preparedness efforts” (2009, page 94).

2.4 Explaining Local Hazard Mitigation Plan Quality

This section synthesizes the previous two sections by exploring current understanding of the factors that explain variations in hazard mitigation plan quality and identifying ways that Social Network Analysis concepts and tools might enhance and extend understanding of the influence of these factors. Specifically, it first reviews previous research on variation in hazard mitigation plan quality. It then reviews three categories of factors driving hazard mitigation plan quality, including planning process factors, federal and state planning policy context factors, and local community characteristic factors, and for each of the categories of factors identifies how a social network analysis approach can provide further insights.15 Hazard mitigation planning has been defined as an ongoing process most often undertaken by a committee of stakeholders who rely on communication and

15 There is limited research to date on hazard mitigation plan implementation. Existing research on that topic was reviewed in section 2.3.b.
collaboration to develop, implement, and monitor plans and policies (Burby 1998.) This definition closely reflects the concepts of communicative and collaborative planning processes discussed earlier (Forester 1989 and Innes and Booher 2010).

2.4.a Local Hazard Mitigation Plan Quality

Multiple studies over the last two decades have developed and refined plan quality indicators and items specific to the hazard mitigation context at both the state and local levels (Berke and French 1994, Berke et al. 1996, Burby and May 1997, Godschalk et al. 1999, Brody 2003, Norton 2005a, Berke, Smith and Lyles 2012). High quality mitigation plans address the full range of principles and indicators in Table 2.3 (Berke, Smith and Lyles 2012). In terms of direction-setting, they articulate a clear vision for a disaster resilient community, provide detailed information about existing hazard exposure, vulnerabilities and risks and community mitigation capabilities, and outline a broad strategy of actions to achieve the vision based on the existing risks and capabilities. In terms of being action-oriented, they demonstrate how an inclusive participatory process was used to develop the plan, how inter-organizational coordination is meaningful and ongoing, and clearly delineate information providing confidence that stakeholders will work to implement proposed actions.

The empirical results of hazard mitigation-oriented plan quality studies provide evidence for low hazard mitigation plan quality at local and state levels. A series of studies through the 1990s into the early 2000s found that the quality of hazards-related material in local comprehensive plans from five states was moderate to low for the plans overall, as well as for the fact base, goals, and policy sections specifically (Berke and French 1994, Berke et al. 1996, Burby and May 1997, Brody 2003, Norton 2005a.) While the comprehensive plans studied pre-dated the Disaster Mitigation Act of 2000, assessments of DMA-compliant hazard mitigation plans are emerging and overall quality of the plans is moderate to low (Kang et al. 2010, Olonilua and Ibitayo 2011).16

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16 Similarly, studies of state hazard mitigation plans completed before and after passage of the Disaster Mitigation Act of 2000 have found mediocre plan quality at the state level (Godschalk et al. 1999 and Berke, Smith and Lyles 2012).
<table>
<thead>
<tr>
<th>Plan Quality Principles</th>
<th>Hazard Mitigation Indicators</th>
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<tbody>
<tr>
<td>Vision and goals</td>
<td>Can include goals and objectives related to hazard loss, governmental coordination and an overarching vision</td>
</tr>
<tr>
<td>Fact Base</td>
<td>Can include indicators related to assessment of hazard exposure, assessment of the vulnerability of people, property and the environment, assessment of risk, and assessment of existing capabilities to reduce vulnerability and risk.</td>
</tr>
<tr>
<td>Policies</td>
<td>Can include actions promoting awareness and knowledge, development regulation actions, and emergency preparedness and response actions.</td>
</tr>
<tr>
<td>Implementation and Monitoring</td>
<td>Can include action-specific implementation information (e.g. the costs, responsible agency, and timetable for actions) and identification of indicators and parties responsible for monitoring over time.</td>
</tr>
<tr>
<td>Inter-Organizational Coordination</td>
<td>Can include integration of hazard mitigation with other planning efforts (e.g. comprehensive planning, transportation, etc.)</td>
</tr>
<tr>
<td>Participation</td>
<td>Can include describing the plan development process and the techniques used to engage the public.</td>
</tr>
</tbody>
</table>

(Based on Berke, Smith and Lyles 2012)

2.4.b. Hazard Mitigation Planning Processes

Local hazard mitigation planning processes are where the proverbial rubber hits the road for mitigation. The organizations involved in planning processes and individuals in those organizations carry out the day-in and day-out tasks of developing and implementing mitigation plans. Of the factors driving hazard mitigation planning outputs, planning processes have received the least attention in the literature to date. And, of those factors, our understanding of planning processes will benefit the most by using the concepts and tools of social network analysis.

2.4.b.1 The Role of Stakeholder Diversity in Hazard Mitigation

Communicative and collaborative planning theory suggest that stakeholder diversity is important because a wide range of planning-related capacities are needed to develop and implement
hazard mitigation plans that help reduce and eliminate risk. No one stakeholder or group of
stakeholders brings all the necessary capacities. Prior research has refined hazard mitigation specific-
concepts of the types of capacities needed to improve planning outputs. Empirical studies testing the
influence of some of these concepts point to a potentially powerful influence of stakeholder diversity
on hazard mitigation planning outputs. Yet, key gaps remain in understanding which stakeholders
participated in the planning processes, how they participated, and if and how variations in
participation influence planning outputs. Social network analysis concepts and techniques can help
fill these gaps.

Smith identifies five types of capacities that need to be leveraged in hazard-related planning
processes: administrative, fiscal, technical, legal and political capacities (2011). Early results in the
plan quality literature predating Smith’s typology of capacities did not point to a clear pattern of
More recently, Norton (2005b) found administrative capacity to have a positive influence on plan
quality and financial capacity to have no effect. The plans Norton reviewed were developed largely
using state funds, which means that local variation in financial resources may not have mattered
(Norton 2005b). Using a somewhat broader concept of organizational capacity, Brody and colleagues
(2009) found that higher levels of organizational capacity are positively associated with the use of
five types of structural mitigation measures and the use of fourteen types of non-structural mitigation
measures, including land use measures. Meanwhile, planning agency commitment, which aligns with
concepts of political capacity, is positively associated with the quality of local plans (Berke and

17 Smith organizes the five types of capacity as follows: administrative capacities (e.g. number of planning staff,
personnel, and/or contractors available to develop and implement a mitigation plan), fiscal capacities (e.g.
access to internal and external financial resources to support mitigation planning), and technical capacities (e.g.
ability to use analytical tools such as Geographic Information Systems (GIS) and HAZUS, a loss estimation
tool), legal capacities (e.g. the rules and regulations providing legal standing to undertake mitigation-related
actions), and political capacities (e.g. decision-making authority or access to those with such authority).

18 Brody and colleagues concept of organizational capacity is measured using an index of 13 indicators,
including verbal communication, sharing resources, networks, leadership, financial resources, available staff,
data quality, adjustable policies, long range planning, human ecology, hire and retain staff, commitment and
sharing information (2009).
French 1994), the adoption of strong development management programs (Dalton and Burby 1994), the usage of a larger array of development management techniques (Burby and May 1997), and the actual adoption of development management recommendations from plans in regulations (Burby and Dalton 1994). One limitation of these studies, however, is that they did not investigate which stakeholders contribute to which types of capacity.

Burby (2003) makes the connection between planning outputs and stakeholder diversity more explicit by assessing the degree to which the number of different types of stakeholders involved in comprehensive planning processes influenced the number of hazard mitigation measures proposed in a plan and the implementation success ratio of those mitigation measures. Involvement of more types of stakeholders was positively associated with higher numbers of proposed mitigation measures and higher implementation success ratios. Using a count of the number of different types of groups involved is a relatively blunt measure of stakeholder diversity because it treats all types of groups as interchangeable, which may not be the case if the types of capacities they bring to process vary. Nonetheless, Burby’s findings point to the important influence stakeholder diversity can have on planning outputs.

The difficulty in attracting a diverse range of stakeholders to mitigation planning must not be underestimated, however. Even when local governments employ high-end efforts to involve the general public in decisions related to hazard mitigation as part of comprehensive planning processes, public interest is often still very low (Godschalk, Brody and Burby 2003). Limited public involvement was found even in communities in planning-mandate states that put considerable emphasis on and effort into engaging the public. Explanations for low interest include the failure to connect mitigation issues to site-specific, neighborhood level concerns, perceptions among the public of mitigation as primarily a technical issue to be handled by government staff, and perceptions among land use planners that mitigation is addressed by other agencies and planning efforts (Godschalk, Brody and Burby 2003).
While the findings discussed above point to the importance of engaging a broad range of stakeholders and leveraging their combined capacities, social network analysis concepts and techniques can enhance this understanding considerably. To begin with, the concept of network composition (Wassermand and Faust 1994) offers a systematic way to think about how the professional experience, information, skills, beliefs, and other assets individual stakeholders bring to a planning process. Operationalizing network composition by measuring key assets at the individual and/or organization level can provide fine-grained information useful in identifying which types of stakeholders (e.g. emergency managers, local planners, etc.) bring which types of assets needed for effective mitigation planning. This type of analysis can help scholars and practitioners alike identify which types of capacities and assets are underdeveloped in mitigation networks, and in turn, which types of stakeholders need to be targeted for greater involvement to bring those assets into the network. Specifically, if communities want to reduce and eliminate risk by managing growth, systematic analysis of the network composition can identify whether stakeholders currently in the network bring enough land use planning training, experience with and responsibility for regulating land use, and favorable views towards using preventative approaches to mitigation.

Also powerful for improving understanding of hazard mitigation planning processes is the SNA concept of network structure. Drawing on the conceptual work applicable across the social sciences (e.g. Barabasi and Albert 1999, Gould 1993, Guimera and colleagues 2005, Siegel 2010 and others), network structure concepts can be used to determine whether a network is more oriented towards a small-world structure with a balance of bridging and bonding connections or an opinion leader structure characterized by preferential attachment. Hazard mitigation networks may display opinion-leader structures focused on command-and-control style information consolidation and distribution. This type of structure would not be particularly surprising given that mitigation has historically been the responsibility of emergency managers, for whom information consolidation and distribution is essential in an Emergency Operations Center in the days leading up to and after a hazard event. Individuals focused on preventative approaches to mitigation (e.g. zoning, subdivision
regulation, and other development management) in this type of network may simply see their role as providing baseline information about land use to the emergency manager when asked for it.

On the other hand, a network more in line with a small-world or village structure might provide opportunities for greater interaction among the range stakeholders involved. In turn, as the stakeholders share information and ideas, they may craft mitigation plans with more creative, innovative and far-reaching array of mitigation approaches, including preventative approaches, because they are exposed to new partners and the assets those partners bring. Additionally, stakeholders might build more support for implementing the more controversial portions of the plan, such as strengthening land use regulations, because of the shared understandings and trust gained through their interactions developing the plan. In addition to the findings from a broad range of disciplines presented in the papers developing network structure concepts, the empirical works of Schneider, Scholz, Berardo and colleagues in the somewhat similar policy domain of estuarine management indicate variations in network structures are present and those variations have demonstrable consequences on planning and implementation processes (Schneider et al. 2002, Scholz et al. 2008, Berado and Scholz 2010).

2.4.b.2 The Role of Local Planners in Mitigation Planning Processes

When it comes to refining understanding of the factors driving the incorporation of land use approaches into mitigation efforts, social network analysis is particularly useful in exploring the involvement of local planners in hazard mitigation planning processes. One of the few studies on the issue of integration of local planners and emergency managers, an unpublished technical report by Kartez and Faupel, notes that historically limited attention has been paid to the level of communication, cooperation and coordination between local planners and emergency managers (Kartez and Faupel 1994).19 They argue local planning departments provide untapped local resources

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19 Kartez and Faupel approach cooperation between local planners and emergency managers in regards to all four phases of disaster management (i.e. mitigation, preparedness, response and recovery.) They pay the most attention to mitigation and recovery. Since this dissertation focuses on mitigation, their attention to recovery issues is not summarized in detail here.
often poorly leveraged for hazard mitigation (Kartez and Faupel 1994). For example, they argue local planning agencies’ core responsibilities include many tasks central to hazard mitigation; local planning requires a long-term perspective not common to many local agencies, which are more typically concerned with short-term operational responsibilities; and local planners bring many areas of routine expertise useful for emergency management, including geographic information systems analysis and public involvement. Additionally, planning agencies often have authority over areas of local governance over which emergency managers do not (e.g. zoning, subdivision, and capital improvements planning). While the importance of coordination appears to be self-evident, its impact on planning outputs cannot be taken for granted. For example, Kartez and Faupel cite evidence that multi-agency planning efforts can lead to positive outputs in disaster warning and public education, but also note that research on emergency exercises has shown federal and state mandates for local coordination produce limited benefits in the absence of organizational support, executive support, and exchanges between key personnel (1994).

Using data from a survey of local planners and emergency managers in nearly 300 cities, Kartez and Faupel report on numerous exchanges between emergency managers and local planners (1994). They found moderate levels of traditional exchange, including roughly 50% of planning agencies worked on the city’s emergency plan and a similar percentage of planning agencies are part of a multi-department hazards committee (1994). Roughly 40% of planning agencies reported participating in emergency exercises and about the same percentage reported taking part in disaster management training. They found low levels of non-traditional exchanges, with roughly 35% of planning agencies providing technical assistance (e.g. GIS) for the emergency management agency. Just over 20% of planning agencies indicated asking the emergency management agency for comments on land use permits. For each of the other non-traditional exchanges the reported

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20 “Traditional” forms of exchanges involve such actions as participating in a plan development process or in an emergency exercise.

21 “Non-traditional” forms of exchange include sharing information, special expertise, staff time, and other resources.
percentages were less than 20%; the non-traditional exchanges include planning agencies helping do hazard vulnerability assessment, helping conduct public involvement, informing emergency management agency of policy changes, and serving as city’s mitigation coordinator. These findings indicate that some communities are leveraging the assets that local planners can contribute to hazard planning capacity, but that in general planners are an under-utilized resource.

Kartez and Faupel also asked local planners their views on planning agency roles in numerous aspects of hazards management and, in general, found planners taking on hazards-related roles to be appropriate (1994). Sixty percent or more of the local planners indicated the following roles to be appropriate for planners: serving on a hazards committee, helping with an emergency plan, helping with a recovery plan, serving on a recovery committee, helping with the hazard vulnerability assessment, and helping with data, such as GIS. Roughly 50% of local planners indicated assisting with public involvement as an appropriate role and nearly as high a percentage indicated assisting with mitigation workshops with builders as appropriate also. More than 40% of local planners indicated serving as the mitigation coordinator would be an inappropriate role for them to take, whereas less than 20% indicated taking on that role would be appropriate. Altogether, these findings suggest that some planners may be willing to take on larger roles in hazard planning.

In a recent American Planning Association volume on best practices in hazard mitigation planning, Godschalk highlights the value of involvement of local planners and the important role strong connections between emergency of managers and planners can play in the case of Lee County, Florida (Godscahlk 2010). Lee County’s comprehensive planning and mitigation goals and objectives are complementary and the plan documents include cross-references for relevant activities and programs. Ongoing implementation is well coordinated through expenditures and regulations. Godschalk points to the important lesson of consistent and long-standing coordination between emergency managers and planners, which in Lee County dates back 30 years. Additionally, the emergency management-planning expertise boundary is bridged not only through strong inter-
departmental cooperation, but also in the single person of the Public Safety Department (i.e. emergency management) director, whose has training in both fields.

Building on Kartez and Faupel’s and Godschalk’s findings, social network analysis can increase our understanding of involvement of local planners in hazard mitigation planning processes in at least four ways. First, drawing on the concept of network composition (Wasserman and Faust 1994), simply identifying if local planners are involved in hazard mitigation planning processes and establishing the expertise, skills and other assets they bring to the planning process may provide important baseline information about whether the hazard mitigation planning process has access to land use-related capacities. Second, understanding where local planners are located in the overall network structure using centrality concepts (Freeman 1977) can demonstrate whether local planners are in positions to have a strong influence on the planning process. Additionally, such understanding can determine if all the stakeholders in the network have exposure and access to the land use-related capacities, which should enable the network to give greater consideration to preventative land use approaches to mitigation. Third, exploring the type and strength of connections between local planners and emergency managers may clarify whether the expertise boundary (Schneider et al. 2003) between land use and emergency management is bridged and, if so, whether the bridge is a strong bonding connection characterized by trust and close collaboration (Burt 2001). Fourth, if hazard mitigation networks take on opinion leader structures (Siegel 2010), then emergency managers’ views about the relevance of land use approaches to mitigation may dominate the network. In these cases, understanding the connections between emergency managers and local planners takes on additional importance because such connections may be essential for increasing the priority that emergency managers, and in turn the full network, place on land use approaches. In addition to providing a more robust understanding of how hazard mitigation planning processes actually work, exploring these four lines of analysis will likely lead to related questions about the factors that influence the structure and function of the network, including its formation and evolution over time.
2.4.c. Federal and State Planning Policy Context

From a national and state perspective, a key aspect of hazard mitigation is overcoming the shared governance dilemma. The shared governance dilemma exists because federal and state governments are responsible for large financial burdens from natural hazard losses, but local governments, which have primary authority for many risk reduction actions, are ‘reluctant partners’ in mitigation and often fail to undertake pro-active mitigation actions (Berke 1998). Federal and state approaches to overcoming this dilemma can vary along multiple dimensions, including the degree to which different levels of government work as partners and the degree to which regulatory or incentive-based approaches are emphasized (Berke 1998). To date, most studies have focused on state approaches to creating a hazard mitigation planning policy context for local governments and the impacts of those approaches, as opposed to federal approaches and their impacts.

State planning policy context has been repeatedly shown to influence local hazard mitigation planning. A key policy lever that state policy makers can use to address the shared governance dilemma is adopting a regulatory mandate for local planning. A series of related studies in the mid-1990s found state-level mandates to develop comprehensive (or general or master) plans to be the major driver of multiple principles of plan quality, such as the fact base, goals and policies included in the plans (Berke and French 1994, Burby and Dalton 1994, Dalton and Burby 1994, Berke et al. 1996, and Burby and May 1997). These studies specifically focused on plan quality in terms of the hazards-related content in comprehensive plans. Burby and May drive the importance of state planning mandates home: “[o]ur findings clearly show planning mandates can make a difference in the attention local governments give to land use and development management” (1997, p. 140). Additionally, when mandates are present other local community characteristic factors (e.g. community wealth, understanding of hazard threats, and demand to develop in hazardous areas) are less influential, suggesting that mandates substitute for these factors (Berke et al. 1996).

All mandates are not equivalent, as differences in the design of the mandate, such as the specific planning requirements local communities must meet and the features designed to increase
local capacity and commitment, are associated with variations in plan quality and implementation of the development management program laid out in the plan (Berke et al. 1996, Burby and May 1997). State planning mandate design also influences the program of participation used to develop the plan (Brody, Godschalk and Burby 2003), which can in turn influence the quality of the plan and the implementation of policies in the plan (Burby 2003).

A closely related aspect of the state planning policy context is the approach of the state agency responsible for enforcing provisions of the planning mandate. For example, studies prior to passage of the DMA showed agencies’ enforcement styles can vary across states and within states over time in the efforts they put forth to build local capacity and commitment and these variations are associated with changes in plan quality (Burby and May 1997, Deyle and Smith 1998). A more recent study\(^\text{22}\) of state efforts under the DMA found important variation in six states’ approaches to supporting local hazard mitigation through staff support, funding, and specific forms of outreach (Smith, Lyles and Berke Forthcoming). In general the states tend to place more emphasis on project-oriented, grants management approaches to helping local governments gain post-disaster federal funding rather than encouraging local governments to use mitigation plans to develop comprehensive, pro-active strategies, although that is not the case in all six states.

Another recent paper investigated the comparative influence of federal and state policy frameworks on local mitigation planning\(^\text{23}\) (Berke, Lyles and Smith www.ie.unc.edu/cscd/publications.cfm.) The paper compares the incorporation of land use-oriented policies in local hazard mitigation plans in two states (Florida and North Carolina) and under two federal policy frameworks (the Disaster Mitigation Act (DMA), a federal mandate applicable to all jurisdictions, and the Community Rating System (CRS), a federal incentive program. When controlling for local community factors the study found no influence of the federal policies (DMA

\(^{22}\) The study is from Department of Homeland Security funded project from which this dissertation extends.

\(^{23}\) This study is also from the Department of Homeland Security funded project from which this dissertation extends.
only vs. DMA-CRS) but did find a strong state-level influence. Local mitigation plans in Florida include fewer land use-related actions than plans in North Carolina.

Perhaps the most promising contribution social network analysis concepts and techniques can make to understanding the influence of federal and state planning policy context on mitigation planning outputs is to examine how mitigation networks vary from state to state. Systematic variations in the structure of the networks (Siegel 2010), the involvement of local planners (Kartez and Faupel 2010), and the types of connections between local planners and emergency managers (Burt 2001) across states may indicate that state approaches to supporting local mitigation are influencing the hazard mitigation stakeholder networks. That is, state influences on local mitigation planning outputs may extend beyond their requirements for what is present in a plan or how the state reviews a plan before it is sent to FEMA for final approval. How state, and federal mitigation officials for that matter, frame the goals, expectations, and requirements for local mitigation planning may shape which stakeholders local emergency managers seek to involve in mitigation planning networks. Thus, higher government officials may indirectly influence the incorporation of land use approaches into mitigation by influencing whether emergency managers prioritize including local planners in mitigation planning processes. Analysis along these lines may point to a need for state and federal mitigation officials to encourage or even require local mitigation officials to involve certain types of stakeholders (e.g. local planners) in planning processes if greater incorporation of preventative land use approaches to mitigation is a state and federal objective.

2.4.d. Local Community Characteristics

Another major category of factors that must be accounted for when seeking to explain hazard mitigation plan quality consists of local community characteristics, including socio-economic characteristics, development-related characteristics, and previous experience with hazard events. Each of these characteristics may influence a local government’s capacity to undertake mitigation planning and the commitment to do so. Thus, while federal and state mandates and their efforts to influence local mitigation planning may be applied consistently to all counties and municipalities,
those counties and municipalities are likely to vary widely in their efforts to follow the directions of higher levels of government. Likewise, local community characteristics may influence if and how a community conducts a hazard mitigation planning process. Local community characteristics have been included in studies explaining hazard mitigation plan quality as well.

The socio-economic characteristics associated with hazard-related plan quality include total population, education levels, and community wealth, typically measured as median home value (Burby and Dalton 1994, Berke et al. 1996, Berke et al. 1999). In each case, the trends across studies point to a positive influence on plan quality for each characteristic, although the results are not fully consistent since some studies have failed to detect an association (Burby and Dalton 1994, Dalton and Burby 1994, Berke et al. 1996, Tang et al. 2008). The overarching interpretation is higher populations, higher education levels, and higher community wealth result in higher levels of planning capacity that enable communities to support stronger planning programs (i.e. more staff, technical analysis, and other capacities).

The development-related characteristics associated with plan quality include population growth, which serves as a proxy for development pressure, and population density, which provides an indication of how urban and built out a community is (Burby and Dalton 1994, Dalton and Burby 1994, Berke et al. 1996, Brody 2003, Burby 2003, Norton 2005). The trends across the studies indicate that population density is negatively associated with plan quality, although some studies have detected no relationships (Burby and Dalton 1994, Dalton and Burby 1994, Berke et al. 1996). The findings are less conclusive for population growth, as one hazards-related study has found a positive association, but other hazards-related studies have not found a significant relationship (Brody 2003, Burby 2003, Norton 2005). The interpretations of these findings argue that higher growth pressures lead to more attention to preserving highly sensitive areas that are often hazardous for development and environmentally valuable; that is, more growth pressure leads to higher levels of commitment to hazard mitigation. However, arguments are made that once a community is very dense there is
pressure to develop remaining areas in spite of their potential vulnerability to hazards, which serves to reduce local commitment to mitigation.

Most studies have conceptualized previous experience with hazards in terms of past losses (e.g. repetitive losses, chronic losses, and catastrophic losses). The trends across the studies are less clear than for the state planning policy context or the other local community characteristics. A recent study that used survey responses to assess mitigation measures being implemented – rather than assessing plan quality – may be instructive. Brody and colleagues (2009) examined associations between the number of years since the most recent damaging flood and total flood losses over the previous five years on both structural and non-structural mitigation measures. They found when it has been fewer years since the most recent damaging flood communities adopt more structural mitigation measures, but not non-structural measures. Conversely, they found when total losses over the previous five years are higher communities adopt non-structural measures, but not structural measures. These findings suggest that previous hazard experience does not have a uniform influence on plan quality and implementation, with communities reacting differently to short-term “windows of opportunity” (Birkland 1997) that arise immediate after a disaster (i.e. communities pursue project-oriented structural measures) and long-term, presumably repeated, hazard losses (i.e. communities pursue more non-structural approaches, which can but does not necessarily include regulatory land use approaches).

As is the case with federal and state planning policy context factors, the most promising contribution social network analysis can offer in enhancing understanding of local community characteristic factors on mitigation planning outputs is understanding if and how local characteristics shape the mitigation networks. This approach again focuses on network composition concepts (Wasserman and Faust 1994). In particular, socio-economic characteristics may influence the amount

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24 Burby and Dalton (1994) found a negative association with plan quality for repetitive losses, while Burby (2003) found a positive association for chronic losses. Similarly, Burby and Dalton (1994) found a negative association with plan quality for catastrophic losses, but Dalton and Burby (1994) found no significant association.
of local resources available to hire staff, employ consultants and otherwise invest in hazard mitigation planning processes. Development-related characteristics may influence the degree to which land use issues are related to other community concerns, including hazards, which in turn may influence whether emergency managers engage local planners in mitigation planning.

In line with the finding that very recent flood losses increase the use of structural approaches to mitigation and repeated losses increase the use of non-structural approaches (Brody et al. 2009), past experience with hazard losses may influence which stakeholders are involved in mitigation planning processes. More recent losses may focus the emergency manager’s and community’s attention on immediate reconstruction and recovery, which may lead to greater inclusion of public works and public safety officials. On the other hand, repeated losses in the absence of a recent event may allow an emergency manager and the broad community to step back and focus on long-term risk reduction, which may lead to greater inclusion of local planners focused on managing development patterns. Put slightly differently, when communities are focused on short-term recovery in the wake of a disaster event they may build their mitigation network around structural projects whereas a community that has a history of losses but is not currently consumed with short-term recovery, may try to build their network around non-structural approaches.

A related set of insights that social network analysis may offer into the influence of local community characteristics on mitigation planning is on changes of network structure and activity over time. Social networks are not static as stakeholders leave the network (e.g. through retirement, death or leaving a job) and new stakeholders enter the network or become more active. If hazard mitigation networks are extensions of emergency operations networks or are built around short-term recovery, then the strength of ties in the network may ebb and flow over time depending whether there has been a recent hazard event. Analysis along these lines may point to important factors that federal, state and local officials must contend with when trying to foster and strengthen mitigation networks.
2.5 Conclusion

This chapter has reviewed three main bodies of literature relevant to the development of the conceptual framework in Chapter 3. First, the plan evaluation literature provides concepts, tools and empirical applications of those concepts and tools that can be used to deepen understand the outputs of planning processes and, in turn, lay the foundation for increased understanding of the factors influencing planning outcomes. Similarly, the social network analysis literature includes numerous concepts, tools, and empirical applications of those concepts and tools that can be used to develop more robust understanding of communicative and collaborative planning processes. Third, the literature on hazard mitigation planning provides a rich test bed for understanding three main sets of factors that drive planning outputs (i.e. planning processes, state and federal planning policy contexts, and local community characteristics). A key objective of this chapter has been to illustrate how social network analysis concepts and tools can be particularly useful for enhancing and extending our understanding of the factors that lead to stronger hazard mitigation planning outputs.
Chapter 3

Conceptual Framework for Predicting Land Use Planning Outputs from Hazard Mitigation Planning Processes

3.1 Introduction

This dissertation proposes to examine multiple dimensions of hazard mitigation planning, with a goal of contributing to current understanding of the influence of stakeholder networks on hazard mitigation planning outputs. A longer-term goal is contributing to understanding of the influence of planning policy context on stakeholder networks and planning outputs. The lack of a clear theoretical model of how hazard mitigation stakeholder networks relate to planning policy context and to planning outputs and outcomes limits understanding of the process of hazard mitigation planning. It also limits planning practice because it is difficult to identify cause and effect relationships that can help policy makers and practitioners make decisions about stakeholder involvement in hazard mitigation planning.

The main thesis is that the integration of local planners into hazard mitigation planning networks leads to higher levels of land use-related planning outputs. In order to test this thesis, a conceptual model is developed to predict land use-related plan quality and plan implementation, using stakeholder network diversity, including incorporation of local planners, and stakeholder network structure as predictor variables while accounting for potential confounding factors.
3.2 Conceptual Framework Overview

The conceptual framework consists of six dimensions, which are organized into three pairs. The first pair of dimensions relates to outputs of planning processes. One dimension focuses on the planning output of plan quality, particularly the extent to which hazard mitigation plans incorporate land use-oriented approaches to mitigation. The other dimension focuses on the planning output of plan implementation, particularly the extent to which hazard mitigation stakeholders are working to implement land use-oriented approaches to mitigation. The second pair of dimensions relates to the planning process. One dimension is stakeholder network diversity, which includes the range of professional specializations (especially local planners), years of experience, technical and administrative skills, and beliefs about approaches to mitigation. The other dimension is stakeholder network structure, including the centrality of key stakeholders (e.g. local planners and emergency managers) in the network, bridging connections across expertise boundaries (e.g. between local planners and emergency managers), and the overall structure of the network. The third pair of dimensions relates to the state and local contexts for hazard mitigation planning processes. One dimension relates to the state planning policy context for hazard mitigation and land use planning, including state mandates for local communities to develop plans and state support for local planning. The other dimension relates to the local community characteristics, including socio-economic characteristics, development-related characteristics, and previous experience with disasters. These six dimensions have guided data collection for this dissertation, as laid out in Chapter 4.

A seventh dimension, disaster resilient outcomes, is also relevant, although it is not directly addressed in this dissertation. Building on Holling’s concept of resilience from ecology, in the context of hazards “resilience is defined as the ability of social systems, be they the constituent element of a community or society, along with the bio-physical systems upon which they depend, to resist or absorb the impacts (deaths, damage, losses, etc.) of natural hazards, to rapidly recover from those impacts and to reduce future vulnerabilities through adaptive strategies” (Holling 1973, Peacock et al. 2008, page 5). Disaster resilient outcomes are the long-term changes in underlying community
vulnerability, risk and sustainability, which arise as a result of jurisdiction-level and individual-level planning outputs. One of the elements of a community that can be more or less resilient is its stakeholder network. In line with the hazards-oriented resilience definition above, the network analysis literature defines resilience as the ability of a network to maintain properties (such as short connections between stakeholders) when one or more stakeholders are removed from the network (Newman 2003). Since measurement of outcomes in general requires longitudinal study and measurement of disaster resilient outcomes in particular often requires the occurrence of a hazard event, they are beyond the scope of this research project. Nevertheless, the disaster resilient outcome dimension is included in the conceptual framework because planning outputs in and of themselves are not the real ends of interest, but are means to outcomes.

Figure 3.1 illustrates the conceptual framework, the seven dimensions, and the relationships between the dimensions. The boxes represent the dimensions, each of which consists of multiple variables. Arrows represent hypothesized relationships between the dimensions. Solid lines are of primary interest in this dissertation, while dotted lines are relationships that require longitudinal data not available for this project. The remainder of this chapter describes each of the dimensions and hypothesized relationships and concludes with a summary of the research questions addressed in this study.
3.3. Conceptual Dimensions

3.3.a. Plan Quality

In the context of Disaster Mitigation Act provisions requiring adoption of local hazard mitigation plans, the quality of the plan itself is the planning output of primary interest. Plan quality refers to the degree to which the contents of a plan serve the purposes for which a plan is intended, such as mitigating natural hazards (Berke, Godschalk, and Kaiser 2006). Of the core principles of plan quality (Berke, Kaiser and Godschalk 2006, Berke and Godschalk 2009), three are most relevant to evaluating the incorporation of land use into hazard mitigation plans: fact base, policies and implementation. The fact base and policies principles relate to the direction-setting aspect of plans, whereby a jurisdiction identifies existing conditions and opportunities for strategic action (Berke, Smith, Lyles and Reynolds 2011). The implementation principle relates to the action-oriented aspect
of plans, whereby a jurisdiction demonstrates how it intends to act on the plan rather than have it collect dust on a shelf (Berke, Smith, Lyles and Reynolds 2011).

The fact base principle indicates that plan quality is improved when a plan “provides the empirical foundation to ensure that key hazard problems are identified and prioritized, and mitigation policy-making is well-informed” (Berke, Smith and Lyles 2012, p. 140). Land use-related information is incorporated into the fact base in the form of an assessment of a jurisdiction’s existing capabilities for mitigating hazards through development management. Second, the policies principle indicates that plan quality is improved by inclusion of proposed actions that “serve as a general guide to decisions about development and assure that plan goals are achieved” (Berke, Smith and Lyles 2012, p. 140). The proposed actions can include a wide range of land use-related polices and programs to manage development to mitigate hazards. Third, the implementation principle indicates that plan quality improves when the plan “involves assignment of organizational responsibilities, timelines and funds to implement a plan,” which together demonstrate commitment and thoughtful attention to undertaking and seeing through to completion the actions proposed in the plan (Berke, Smith and Lyles 2012, p.140). Land use-related aspects of the implementation principle include identification of 1) the agency with principal responsibility for overseeing completion of a proposed land-use action, 2) the timeline for completing the land use-related action, and 3) the estimated cost of completing the land use-related action. The conceptual framework draws on previous hazard mitigation plan quality studies and synthesis articles on managing land use to mitigate hazards to populate the list of specific land use-related actions relevant to this dissertation (Berke and French 1994, Olshansky and Kartez 1998, Godschalk et al. 1999).

3.3.b. Plan Implementation

Progress on implementation of land use-related approaches to mitigation is also a key planning output. The plan implementation literature offers multiple concepts of implementation. Plan conformance refers to whether implementation actions taken subsequent to development of the plan conform to the policies and actions laid out in the strategy in the plan (Alexander and Faludi
1989, Berke et al. 2006). Plan performance refers to “whether the plan plays a role in those decision situations in which it was meant to be used” (Mastop and Faludi 1997, 820). Hopkins offers a plan use concept, which focuses on the purposes for which a plan was developed and how it is used in ongoing decision situations (2001).

The conformance approach is used here to conceptualize implementation of the land use policies and actions because the focus is on efforts taken to implement the policies and actions proposed in adopted local hazard mitigation plans. The list of land-use related proposed actions included in an adopted hazard mitigation plan comprises the basis against which conformance is assessed. Various levels of conformance are possible, including completion of the action, action in progress but not completed, action not in progress but still proposed, and action eliminated from list of proposed actions before completion. Assessing these levels of implementation conformance indicates the degree to which a plan is guiding ongoing local action and the degree to which a community is using land use actions that are proposed in the plan to mitigate hazard risks.

3.3.c. Stakeholder Network Diversity

Stakeholders bring a wide range of assets to planning process networks (Booher and Innes 2002 and Innes and Booher 2010). These assets form the bedrock of the mitigation planning capacity of the jurisdictions participating in hazard mitigation planning processes. Brody and colleagues (2009) found higher levels of organizational capacity lead to the adoption of more non-structural mitigation techniques, including land-use oriented techniques, for flood mitigation. The concept of organizational capacity used here is that of organizational capacity distributed across the stakeholders involved in the planning process. In the language of social network analysis (Wasserman and Faust 1994), these assets represent the composition of the network.

Three main types of assets are conceptualized to cover the breadth of capacities needed to develop a hazard mitigation plan. The first set of assets stakeholders bring to hazard mitigation planning processes is their own personal experiences with hazard mitigation. In this conception, experience includes the stakeholder’s professional specialization or training, which can include a
huge range of disciplines including emergency management, land use planning, engineering, and law, each with their own sets of underlying values, missions and action-oriented training. It also includes the length of time working on hazard mitigation because knowledge and understanding of the complex array of factors involved in hazard mitigation is assumed to build over time. Together professional specialization and training and length of time working on mitigation may inhibit or enhance willingness to consider and prioritize land use-related actions.

Second, stakeholders bring specific skills and authorities that are conceived of as contributing to jurisdiction and stakeholder-level outputs. Key skills and authorities include 1) plan process skills (e.g. outreach and communication or conflict resolution and facilitation), 2) implementation of regulatory approaches to mitigation skills and authorities (e.g. drafting and interpreting regulations or reviewing site plans and executive/legislative authority for rule making) and 3) implementation of project-based approaches to mitigation skills and authorities (executive/legislative authority for allocating funding through budgeting or distributing funding for mitigation projects and technical skills such as GIS and HAZUS). These skills and authorities are needed to develop and implement hazard mitigation plans.

Third, in line with the Advocacy Coalition Framework (Sabatier and Jenkins-Smith 1993) the beliefs of individual stakeholders are conceived to influence how they interact with other stakeholders, each of which has their own beliefs. Here the focus is on policy core beliefs related to the value of six approaches to hazard mitigation – property protection, natural resource protection, prevention (including land use-related approaches), structural projects to control hazards, public education and awareness, and emergency services. It may seem strange to conceive of beliefs as an asset. Yet, in the context of incorporating land use-related actions into hazard mitigation planning, individual stakeholder’s beliefs about prevention approaches to mitigation, may serve to inhibit or enhance willingness to consider and prioritize land use-related actions.

These three categories of assets constitute the “building blocks” for planning processes (Booher and Innes 2002, p. 227). A wide diversity of each category is needed to develop and
implement a hazard mitigation plan. In turn, the *diversity of the steering committee* is a key component of the stakeholder network diversity conceptual dimensions. In particular, experience, beliefs, and skills related to land use approaches to mitigation are critical. Emergency managers and professionals from other domains bring a wide range of assets important for hazard mitigation, but local planners typically receive training to conduct analysis and involve the public in planning processes, among other assets that support hazard mitigation planning (Kartez and Faupel 1994). Thus, the *involvement of local planners* in the stakeholder network is another key component of this dimension.

Even if all the necessary assets are present in a mitigation planning process, the individual experiences, beliefs, and skills are of limited value if they are not joined in a way that pinpoints the key risks from hazards, identifies the gaps in existing capabilities, and then uses this information to form a coherent and targeted strategy of mitigation actions. It is only through the relationships between the stakeholders that these building blocks can be joined together effectively.

3.3.d. Stakeholder Network Structure

The interdependent nature of stakeholders’ interests is a key driver of planning outputs (Booher and Innes 2002, Innes and Booher 2010.) In any planning process, stakeholders explore and reconcile their interdependencies through relationships with each other. These relationships take many forms, from sharing information used to develop a plan to collaborating on implementation of actions proposed in a plan. Understanding these types of interdependent relationships is a key motivation of social network analysis, which conceives of the patterns of relationships between stakeholders as creating an overall network structure (Wasserman and Faust 1994). Understanding how network structure serves to enable or constrain individual action in planning processes is an important and growing area of research (Dempwolf and Lyles 2011.)

This dissertation conceptualizes network structure by first focusing on the patterns of sharing information used to mitigate hazards. The structure of the information-sharing network is important because even if one stakeholder in the network possesses a certain type of information it does not necessarily mean that other stakeholders are aware of the information or have access to it. Only if the
information is shared widely among stakeholders can its validity, value, and implications be weighed and accounted for in the planning process. Constraints on information flow due to the structure of the network inhibit the utilization of information assets. Similarly, focusing on more generally conceived collaboration relationships can provide insights as well. If stakeholders, especially emergency managers and local planners, work together on a regular basis, it is likely that there will be more broad-based support for ongoing implementation of land use-related approaches to mitigation. Given previous findings of limited integration of local planners and emergency managers (Kartez and Faupel 1994), the position in the network of the stakeholders that bring land-use related assets to the planning (e.g. local planners) is of particular importance.

Network structure characteristics are conceptualized at the level of all of the stakeholders together (i.e. complete network), pairs of stakeholders (i.e. dyadic ties), and at the level of individual stakeholders (i.e. ego networks) (Wasserman and Faust 1994, Jackson 2008). Although planning research conceptualizing network structure characteristics is limited, there are social network analysis studies that are instructive in conceptualizing hazard mitigation network structure. For example, complete networks exhibiting small world structures with widespread bridging connections between clusters exhibiting bonding connections between stakeholders appear to enable joint problem solving to a greater degree than networks exhibiting preferential attachment structures (e.g. opinion leader networks) with one stakeholder providing almost all of the connections in the network (Watts and Strogatz 1999, Berardo and Scholz 2010, and Siegel 2010). Networks exhibiting preferential attachment can consolidate and distribute information through a central hub efficiently but are less likely to foster discourse among the broad range of stakeholders (Barabasi and Albert 1999, Berardo and Scholz 2010, and Siegel 2010). Additionally, policy networks that bridge expertise, governmental, and ideological boundaries between stakeholders are associated with multiple conditions that foster cooperative governance (Schneider et al. 2003). Policy network research has also found that organizations embedded in larger, boundary-spanning networks have been found to
collaborate more than organizations embedded in smaller, densely connected networks (Scholz et al. 2008).

Three concepts of network structure are employed here. First, overall network structure is conceived as existing along a spectrum between small-world networks with a balance of intra-cluster and inter-cluster connections between stakeholders on one end of the spectrum and preferential attachment networks with almost all connections concentrated in a central stakeholder on the other end of the spectrum. The second conceptualization of network structure is whether the expertise boundaries between local planners and emergency managers – two areas of specialization relevant to hazard mitigation – are bridged. Third, at the individual stakeholder level, the focus will be on the centrality of local planners in the network. Concepts of centrality include degree centrality (e.g. the total number of connections) and betweenness centrality (the proportion of connections between other stakeholders whose shortest paths runs through the stakeholder).

3.3.e. State Planning Policy Context

The state planning policy context has been repeatedly shown to influence aspects of the planning process and jurisdiction-level planning outputs, particularly plan quality (Berke and French 1994, Burby and Dalton 1994, Berke et al. 1996, Burby and May 1997, Deyle and Smith 1998, Brody 2003). In this dissertation, state planning policy context is conceptualized in two ways. First, state planning mandates have been found to increase the quality of local planning for hazard mitigation (Berke and French 1994, Burby and Dalton 1994, Berke et al. 1996, Burby and May 1997). Second, under the DMA, which has been characterized as a reflexive law, state agencies with mitigation oversight play important roles in interpreting federal mitigation goals and regulations and building capacity and commitment for local mitigation planning (Nolon 2009). State agency approaches to interpreting goals and enforcing regulations can range from top-down and coercive to more flexible and cooperative (Burby and May 1997 and Deyle and Smith 1998). Likewise, state efforts to build local capacity and commitment to planning for hazards also influence the quality of local planning for hazard mitigation. Smith and colleagues have identified multiple aspects of state support for local
mitigation in the context of DMA hazard mitigation planning, including staffing levels, dedicated
funding, efforts to increase awareness of hazard mitigation, and efforts to encourage integration of
land use into hazard mitigation plans (Smith, Lyles and Berke, Forthcoming).

3.3.f. Local Community Context

The local community context dimension is conceptualized as having three main aspects, each
of which have been demonstrated to influence hazard mitigation planning outputs in previous studies.
The first conceptual aspect is the socio-economic characteristics of the community. Overall
population size provides an indicator of a community’s population to support an ongoing planning
program, as smaller communities in particular may have limited ability to maintain staff or agencies
to address land use or hazards issues. Similarly, community wealth provides an indicator of the
community’s capacity to fund an ongoing planning program. Both have been found to have positive
influences on hazard mitigation planning outputs (Burby and Dalton 1994, Berke et al. 1996, and
Berke et al. 1999).

The second conceptual aspect of the local community context dimension is the development
characteristics of the community. Population density provides an indication of the amount of
remaining developable land and overall urbanization. Past research has found some negative
associations with hazard mitigation planning outputs, likely because once communities are very dense
little developable land remains and pressure increases to build on it regardless of its hazard exposure
(Burby and Dalton 1994). The other conception of development characteristics is population growth,
since communities experiencing high rates of population growth often must accommodate the
increased population with new housing, roads, schools and other development. Population growth
has been found to have a positive association with hazard mitigation planning outputs, likely because
communities facing population growth typically seek to influence the timing, location and other
features of new development that can be addressed through planning (Norton 2005).

The third conceptual aspect of the local community context dimension is past experience with
natural hazards. Past experience with hazards is conceptualized as previous economic losses from
hazard events over a period of time considered to still have influence on public attention to hazards (e.g. losses over the last five or ten years). Previous research has found mixed directions of influence of past losses on hazard mitigation planning outputs, including negative influence (Burby and Dalton 1994) and positive influences (Burby 2003 and Brody 2003). Brody and colleagues found a positive association with flood losses over a five-year period and the use of non-structural approaches, including land use-related actions (Brody et al. 2009). Another conceptualization of hazard experience is recent occurrence of a hazard event, although no significant association was found by Burby (2003) and Brody and colleagues found a positive association with structural approaches to mitigation, but no association with non-structural approaches (2009). In light of these findings, past losses over a longer period of time, as opposed to the number of years since the most recent event, is favored as a more theoretically sound conceptualization of past hazard experience and its potential influence on land use-related hazard mitigation planning outputs.

3.3.g. Feedback Relationships

The conceptual framework in Figure 3.1 focuses on a single iteration of what is in reality an ongoing cycle of plan development, implementation and review with feedback relationships. Planning outputs and outcomes can influence the mitigation planning context and the stakeholder networks involved in the planning processes in multiple ways. For example, disaster resilient outcomes, such as property damage and losses avoided, feed back into local community context conditions like development pressure and community wealth. Successes and failures in developing a high quality plan and implementing its provisions can influence which stakeholders choose to be involved in future planning processes. Tracking of plan quality and implementation can lead to state (and even federal) level policy adjustments that change the mitigation planning context. Because these feedback relationships are beyond the scope of this dissertation, they are not represented on Figure 3.1, although they are important elements of broader planning and mitigation research agendas.
3.4. Hypothesized Relationships

The following relationships are hypothesized among the conceptual dimensions described in this chapter. The main hypotheses correspond to the two research questions outlined in Chapter 1.

**Hypothesis 1:** Inclusion of local planners in hazard mitigation stakeholder networks will lead to greater incorporation of land use approaches in hazard mitigation planning outputs, accounting for the state planning policy context, the local community characteristics, and the diversity of the stakeholder network.

**Hypothesis 2a:** When local planners are included in hazard mitigation stakeholder networks, their inclusion in more central positions in the stakeholder network will lead to greater incorporation of land use approaches in mitigation planning outputs, accounting for the state planning policy context, the local community characteristics, and the diversity of the stakeholder network.

**Hypothesis 2b:** Stronger relationships between emergency managers and local planners will lead to greater incorporation of land use approaches in mitigation planning outputs, accounting for the state planning policy context, the local community characteristics, and the diversity of the stakeholder network.

**Hypothesis 2c:** Structures of hazard mitigation stakeholder networks that support collaborative joint problem solving will lead to greater incorporation of land use approaches in mitigation planning outputs, accounting for the state planning policy context, the local community characteristics, and the diversity of the stakeholder network.

3.5. Conclusions

This chapter has developed a conceptual framework consisting of six conceptual dimensions and hypothesized relationships between those dimensions. The framework is designed to generate questions and hypotheses about the relationships between three sets of conceptual dimensions: hazard mitigation planning outputs, planning process, and state and local contexts. Testing the relationships hypothesized in the framework will help answer the two principal research questions laid out in Chapter 1. The remainder of this chapter summarizes those two questions and how they are addressed in the following chapters.

*Question 1: Does inclusion of local planners in a hazard mitigation stakeholder network lead to the incorporation of more land use approaches in hazard mitigation efforts, when accounting for state planning policy context, local community characteristics, and the diversity of the stakeholder network?*

To answer the first research question, this study considers the hypothesized links in the conceptual framework between the stakeholder asset diversity dimension and the plan quality...
dimension, while accounting for the links between the state planning policy context and local community characteristics dimensions and plan quality. Previous research has found that greater diversity of stakeholders in planning processes can lead to stronger hazard mitigation planning outputs (Burby 2003). Research on the influence of land use-oriented stakeholders in particular on hazard mitigation planning outputs is limited.

The primary approach for assessing the hypothesized links is multivariate regression modeling, including controls for the state planning policy context and local community characteristics dimensions. Testing the strength and significance of regression coefficients helps answer the question of whether greater stakeholder diversity in general, and inclusion of local planners in particular, is related to greater attention to land use approaches in the fact base, policies and implementation components of hazard mitigation plans. Case study analysis will enhance and extend the findings from the regression modeling by also considering the influence of the stakeholder network structure conceptual dimension on mitigation planning outputs. The stakeholder network structure dimension was not included in the regression models due to a lack of available data.

Question 2: When local planners are included in hazard mitigation stakeholder networks, do differences in how they are involved in the network of the hazard mitigation stakeholders contribute to greater incorporation of land use approaches in mitigation efforts?

Prior understanding of what types of stakeholders participate in hazard mitigation planning processes under the Disaster Mitigation Act of 2000 is limited. Thus to answer the second research question it is necessary to first provide systematic descriptive analysis of the stakeholder asset diversity and stakeholder network structure dimensions. This is done through case study analysis combing surveys, interviews, document review, and site visits. This study focuses on the assets (e.g. experience, skills and beliefs) that individual stakeholders involved on official hazard mitigation planning committees bring to the planning process, with particular focus on land use-oriented assets. It also investigates the structure of the information-sharing network, including the centrality of local planners in the network, the degree to which the network bridges the emergency management – land
use planning expertise boundary, and whether the overall structure of the network supports collaborative joint problem solving.

Once this descriptive analysis is completed, then to answer the second question, it is necessary to consider the hypothesized links between the components of the stakeholder asset diversity dimension (i.e. involvement of local planners and steering committee diversity) and stakeholder network structure conceptual dimension (i.e. centrality of local planners, emergency manager – local planner relationships, and overall network structure) and plan quality and plan implementation outputs, while accounting for the state planning policy context and local community characteristics. Previous research on the role of stakeholder network structure in planning in general, and hazard mitigation planning in particular, is limited. Research in related policy domains, such as estuary management, point to potential influences of multiple of aspects of network structure on policy outputs.

Comparative case study analysis is used to examine the hypothesized links between stakeholder asset diversity stakeholder network structure components and planning outputs, while accounting for the other conceptual dimensions. Case selection allows for comparison within and across state planning policy contexts, while accounting for many local community characteristics. Comparing patterns in the cases and building explanations for observed relationships between conceptual dimensions also helps answer the second research question.
Chapter 4

Research Design and Methodology

4.1. Research Design and Methodology Overview

This study will investigate research questions related to the influence of local-level hazard mitigation stakeholder networks on planning outputs, with particular focus on the role of local planners in the networks. The research extends from an ongoing Department of Homeland Security-funded study at the University of North Carolina at Chapel Hill examining influences on the development and implementation of state and local hazard mitigation plans (UNC-CH Institute for the Environment http://www.ie.unc.edu/cscd/projects/dma.cfm).

In order to test the conceptual model presented in Chapter 3, this study employed a quasi-experimental, post-test only design using controls for the state planning policy context and local community characteristics (Shadish, Cook and Campbell 2002.) Multiple sources of evidence, including plan content analysis, survey responses, semi-structured interviews, and secondary data, were used in a mixed method approach consisting of statistical modeling and qualitative case studies. The dissertation research progressed in two phases.

Phase 1 focused on the first research question: Does inclusion of local planners in a hazard mitigation stakeholder network lead to greater incorporation of land use approaches in mitigation efforts, accounting for state planning policy context, local community characteristics, and the diversity of stakeholders involved in the network? It tested the hypothesis that involvement of local planners in hazard mitigation planning stakeholder networks leads to stronger land use-oriented planning outputs. To do so, it drew on plan quality data generated from content analysis and
secondary data drawn from publicly available sources. The sample consisted of 175 local jurisdictions in six states. States on the Atlantic, Gulf and Pacific coasts were selected because they share similar coastal hazard risks, but vary in state planning mandates and regulations and state capacities to support local mitigation planning. The unit of analysis for this phase was the local jurisdiction. Within each of the six states, 25 to 30 coastal jurisdictions were randomly selected for inclusion in the sample of counties and municipalities for the larger Department of Homeland Security-funded study from which this dissertation extends. Regression models were the analytical tools used to test the hypotheses.

Phase 2 concentrated on the second research question: when local planners are included in hazard mitigation stakeholder networks, do differences in how they are involved in the network of hazard mitigation stakeholders contribute to greater incorporation of land use approaches in mitigation efforts? It tested hypotheses related to the centrality of local planners in the networks, the strength of relationships between emergency managers and local planners, and the overall structure of the networks. To test the hypotheses, this line of analysis drew on multiple primary data sets including surveys of hazard mitigation stakeholders, semi-structured interviews with key stakeholders, and document review, as well as the plan quality data and secondary data used in phase 1. The sample for this phase consisted of four jurisdictions drawn from the sample of 175 jurisdictions in Phase 1. The unit of analysis for the case studies was the county-level planning process, which included counties and municipalities within those counties. The case studies employed pattern building and explanation building techniques to evaluate the hypotheses.

This chapter is structured as follows. First, it summarizes the data collection, analysis and variables for Phase 1 regression modeling using plan quality and secondary data. Second, it summarizes the data collection, analysis and variables for Phase 2 case studies using survey, interview and other data. This approach mirrors the actual process of collecting and analyzing the data and the order of presentation of the findings in this dissertation.
4.2. Phase 1 Sample Selection: The selection of the six sample states and the sample jurisdictions within those states extends from the DHS-funded study.

4.2.a. State Selection: The DHS-funded study began by content analyzing the state hazard mitigation plans for all 30 coastal states, including the Great Lakes states (Berke, Smith and Lyles 2012). Coastal states were chosen because they are particularly at risk for hazard losses and face strong development pressures (Beatley, Brower and Schwab 2002 and NOAA 2004.) The resulting data on state mitigation plan quality was combined with data from an Institute of Business and Home Safety and American Planning Association survey of state planning laws (Schwab 2009) to select six states that vary across two dimensions: state hazard mitigation planning context and state mitigation plan quality [See Appendix I for more detail on selection dimensions]. A sample of six states that would vary across both dimensions was sought for jurisdiction-level sampling, data collection, and analysis in order to control for state planning efforts in analyses of local hazard mitigation planning. As shown in table 4.1, the selection process resulted in a sample of six states.

Table 4.1: State Planning Policy Context Characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>California</th>
<th>Florida</th>
<th>Georgia</th>
<th>North Carolina</th>
<th>Texas</th>
<th>Washington</th>
</tr>
</thead>
<tbody>
<tr>
<td>State Hazard Mitigation Plan Quality</td>
<td>Strong</td>
<td>Strong</td>
<td>Weak</td>
<td>Strong</td>
<td>Weak</td>
<td>Moderate</td>
</tr>
<tr>
<td>State Planning Context</td>
<td>Moderate</td>
<td>Strong</td>
<td>Weak</td>
<td>Strong</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
</tbody>
</table>

4.2.b. Selection of Sample Jurisdictions In each of the six states for the DHS-funded study, a sampling frame of all counties and municipalities with a population greater than 2,500 and less than 750,000 located in counties designated as coastal in line with the federal Coastal Zone Management Act was generated to serve as the sampling frame for selecting local hazard mitigation plans to content analyze [See Appendix I for more detail on the sampling frame criteria]. For each state, 30
jurisdictions were randomly selected from the sampling frame, with the exception of Georgia, which has a combined total of 25 coastal counties and municipalities, as shown in Table 4.2.

Table 4.2: Counties and Municipalities by State

<table>
<thead>
<tr>
<th>Variable</th>
<th>California</th>
<th>Florida</th>
<th>Georgia</th>
<th>North Carolina</th>
<th>Texas</th>
<th>Washington</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counties</td>
<td>5</td>
<td>6</td>
<td>11</td>
<td>13</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Municipalities</td>
<td>25</td>
<td>24</td>
<td>14</td>
<td>17</td>
<td>25</td>
<td>26</td>
</tr>
</tbody>
</table>

4.3 Phase 1 Data Collection

4.3.a. Plan Quality Content Analysis Overview: This dissertation draws on the local plan quality dataset generated as part of the larger DHS-funded study of mitigation planning. The content analysis methods used were in line with current practices in plan quality evaluation studies and incorporate recommendations for increasing the reliability of coding data drawn from the communications literature on content analysis (Berke and Godschalk 2009 and Krippendorff 2004)

4.3.a.1. Plan Collection: Collection of the most recent hazard mitigation plan for each of the 175 local jurisdictions in the six state sample for the larger project was conducted in 2009 and 2010 by downloading plans from state and local government websites and by contacting state governments, local governments and private consultants.1 [See Appendix I for more detail about plan collection process.]

4.3.a.2. Coding Instrument Development and Testing: A local plan coding instrument consisting of more than 400 separate items addressing seven core plan quality principles applied to hazard mitigation was developed and used to generate data on the quality of the plans. The items were drawn from previous studies (primarily Godschalk et al. 1999 and the state plan coding done as part of the larger DHS-funded project) as well as the FEMA Blue Book, which provide official guidance for local plans (FEMA 2008). This dissertation draws on the data related to three principles: the fact base

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1 The standard used in the study to determine whether a plan could be content analyzed or not was whether or not the local plan had been approved by the relevant state agency as ready to submit to FEMA for federal review.
(i.e. the capability assessment), the policies (i.e. proposed actions) and implementation (i.e. information provided about how proposed actions will be implemented). [See Appendix I for more detail.]

4.3.a.3. Coding Procedures: The coding process to generate the dataset consisted of two coders independently coding the plans in line with recommendations from the communications literature on content analysis (Krippendorff 2004). Once both coders had finished coding the full plan, they reconciled the differences in the coding scores to create a master dataset [See Appendix I for a more detailed description of the coding procedures.] Coding the full set of plans for the 175 jurisdictions took a team of seven coders from June 2010 and June 2011. Overall inter-coder reliability scores indicated 88% agreement in the full dataset, which is within the range of reliability scores for plan quality studies (Berke and Godschalk 2009). For the subset of items used in this dissertation, the agreement was 95.4% and, on an item-by-item basis, ranged from 74.9% to 100.0%. Krippendorff’s alpha scores for the individual items ranged from 0.80 to -0.06.

4.3.a.4. Creation of Plan Quality Indexes and Counts: Three sets of items were used to generate indexes and counts, which were developed using items from the full plan quality dataset for use in statistical models in this dissertation.

The first set was an index of sixteen existing preventative land use policies and actions assessed in the capability assessment section of the plan (i.e. the fact base principle). Table 4.3 describes each of the sixteen land use related policies and actions assessed. The second set was a count of the number of the sixteen land use policies and actions shown in Table 4.3 proposed as part of the jurisdiction’s mitigation strategy for future action (i.e. the policies principle). The third set was a count of the items of implementation-related information for the sixteen land use policies and actions proposed as part of the jurisdiction’s mitigation strategy. That is, for each of the sixteen policies, the count included whether the plan identified 1) a party responsible for the action, 2) a timeline for implementation, and 3) a project cost for the action.
### Table 4.3: Land Use Actions Assessed in Plans

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density Bonuses</td>
<td>Density bonuses such as ability to develop with greater density in return for dedication or donation of land in areas subject to hazards</td>
</tr>
<tr>
<td>Tax Abatement</td>
<td>Tax breaks offered to property owners and developers who use mitigation methods for new development</td>
</tr>
<tr>
<td>Cluster Development</td>
<td>Provision requiring clustering of development away from hazardous areas, such as through conservation subdivisions</td>
</tr>
<tr>
<td>Density of Land Use</td>
<td>Provision regulating the density of land use (e.g. units per acre); may be tied to zoning code</td>
</tr>
<tr>
<td>Density Transfer</td>
<td>Provision for transferring development rights to control density; may be transfer of development rights or purchase of development rights</td>
</tr>
<tr>
<td>Land Suitability</td>
<td>Hazards are one of the criteria used in analyzing and determining the suitability of land for development</td>
</tr>
<tr>
<td>Permitted Land Use</td>
<td>Provision regulating the types of land use (e.g. residential, commercial, industrial, open space, etc.) permitted in areas of community; may be tied to zoning code</td>
</tr>
<tr>
<td>Setbacks or Buffer Zones</td>
<td>Provision requiring setbacks or buffers around hazardous areas (e.g. riparian buffers and ocean setbacks)</td>
</tr>
<tr>
<td>Site Review</td>
<td>Provision requiring addressing hazard mitigation in process of reviewing site proposals for development</td>
</tr>
<tr>
<td>Special Study</td>
<td>Provision requiring impact fees or special study fees on development in hazardous areas; may indicated fees required to cover costs of structural protection</td>
</tr>
<tr>
<td>Subdivision Regulations</td>
<td>Provision controlling the subdivision of parcels into developable units and governing the design of new development (e.g. site stormwater management)</td>
</tr>
<tr>
<td>Zoning Overlays</td>
<td>Provision related to using zoning overlays that restrict permitted land use or density of land use in hazardous areas; may be special hazard zones or sensitive open space protection zones</td>
</tr>
<tr>
<td>Site Public Facilities</td>
<td>Provision related to siting public facilities out of hazardous areas in order to maintain critical services during and after hazard events</td>
</tr>
<tr>
<td>Development Moratorium</td>
<td>Provision imposing a moratorium on development for a set period of time after a hazard event</td>
</tr>
<tr>
<td>Post-Dis. Land Use Change</td>
<td>Provision related to changing land use regulations following a hazard event; may include redefining allowable land uses after a hazard event</td>
</tr>
<tr>
<td>Post-Dis Cap. Imp.</td>
<td>Provision related to adjusting capital improvements to public facilities following a hazard event</td>
</tr>
</tbody>
</table>

#### 4.3.b. Phase 1 Secondary Data Collection:
Three main sources of secondary data were used in this study. The Institute for Business and Home Safety, in cooperation with the American Planning Association (Schwab 2009), conducted a survey of state planning laws, with particular attention to whether or not the state mandates local plans, whether the plans have to address hazards, and the degree to which the plans have to be consistent with state goals or plans. The US Census collects
data on numerous variables useful for measuring the socio-economic context at the county and municipal levels (US Census 2000 and 2010). The Public Entity Risk Institute has consolidated federal data on Presidential Disaster Declarations in a database (PERI 2011). The web-based database included county-level data on the number of presidentially declared disasters by type and year.

4.4. Phase 1 Analytical Techniques: This central thesis of phase 1 is inclusion of local planners on hazard mitigation stakeholder committees is related to higher levels of incorporation of land use actions into hazard mitigation plans. This dissertation used regression models to examine the relationships between local planners and land use actions in mitigation plans. Multiple regression models were used to test the strength, direction and significance of the influence of independent variables, including local planners, on the incorporation of land use actions into mitigation plans. The remainder of this section details the selection of the regression models and model diagnostics. Selection of the dependent and independent variables and descriptive statistics for each are detailed in section 4.5.

4.4.a. Model Selection: The dependent variables used in the models fall into two measurement categories: index and count variables. For the index variable, an ordinary least squares regression model was used based on the assumption that the index is continuous and normally distributed. For the count variables, ordinary least squares regression models are not appropriate because the assumptions of a continuous, normal distribution are, by definition, violated. Instead, Poisson models were used for the count variables. All statistical models were run in the R statistical computing

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2 Census data for Goleta, CA was not available for 2000 because it was not incorporated until 2002. Data from the 2005-2009 American Community Survey was used instead for the Median House Value.

3 Using data from the Spatial Hazard Events and Losses Database for the United States (SHELDUS) to measure disaster experience (Hazards & Vulnerability Research Institute 2011) was considered. This database includes loss estimates for hazard events at the county level. However, due to the way that the Federal Emergency Management Agency reports disaster losses and the way the SHELDUS database is constructed, I was reluctant to use the data. Namely, if FEMA reports losses (of property or life) for multiple counties, the losses are simply divided evenly across the counties. Thus, a $20 million disaster with 7 fatalities affecting three counties is reported as having a $6.66 million impact and 2.33 fatalities for each county.
platform and the programming scripts are included in Appendix VII. Model coefficients, standard
erors, T-values (or Z-values) and P-values are reported.

4.4.b. Model Diagnostics: For the ordinary least squares model, the R-squared, adjusted R-squared
and F-statistic are reported. For the Poisson models, the main concern was overdispersion, or
dispersion parameter values considerably over 1.00, which can lead to over-confidence in the
estimates of error and concluding that variables are statistically significant when that is not the case. Poisson models fix the dispersion parameter at 1.00, while quasi-Poisson models estimate the
dispersion parameter from the data. As a diagnostic check, all Poisson models were run also as quasi-
Poisson models. For all Poisson models, the null deviance, residual deviance, and Akaike
Information Criterion are reported. Alternative model specifications, namely median regression
models (quantile regression with the quantile at 0.5), were used to test the robustness of the results to
outliers because median regression focuses on the median rather than the mean of the data and thus is
more resistant to skewing by a few especially high or low observations. Additionally, residuals were
checked for heteroskedasticity and variance inflation factors were checked for multi-collinearity.

4.5. Phase 1 Variables: This section describes the dependent and independent variables used in the
Phase 1 regression models.

4.5.a. Dependent Variables: The dependent variables for the cross-sectional regression models are
focused on outputs of the planning process. As described above, the plan quality data were used to
develop an index or count for three different types of planning outputs: assessment of land use action
capabilities (index); proposed land use actions (count); implementation information for proposed land
use actions (count). The one index and two counts each serve as the dependent variable for a separate
regression model. Definitions, summary statistics, and data sources for each of the dependent
variables are presented in Table 4.4. [Appendix I includes more detailed summary statistics.]

---

4 Underdispersion is also a possibility, although it is considered less of a problem unless there is a theoretical
reason to believe that it needs to be modeled explicitly. Underdispersion can lead to under-confidence in the
estimates of error, which in essence means that one is setting a higher standard for concluding that a variable is
statistically significant.
Capability assessments in hazard mitigation plans consist of a review of the policies, programs and other capabilities a community has to mitigate hazard losses, as well as an identification of existing gaps in the capabilities. Hazard mitigation capabilities addressed in plans have been assessed in previous studies, including Godschalk et al. (1999) and Berke, Smith and Lyles (2012). The summary statistics show a low mean land use capability score (0.94) and a maximum score (5.625) that is slightly above the midpoint of the possible 0-10 range. The Cronbach’s alpha score for the reliability of the multi-item index is 0.781.

Proposed actions in hazard mitigation plans consist of the short-term, and in some cases, long-term actions the jurisdiction intends to implement to mitigate hazards as part of a mitigation strategy. Hazard mitigation actions included in plans have been assessed in previous studies, including Berke and French (1994), Burby and Dalton (1994), Berke et al. (1996), Godschalk et al. (1999), Burby (2003), Brody (2003), and Berke, Smith and Lyles (2012). Land use-related actions are frequently included in these studies. The summary statistics show a low mean proposed land use action (1.14) and a distribution skewed to the lower end of the range. The maximum count (10) is well into the higher end of the possible range of 0 to 16, though.

---

5 The apparent truncation of the distribution of capability assessment scores motivated the use of a median regression model on the capability assessment (fact base) data as a test of the robustness of the model.
Implementation information in hazard mitigation plans consists of the information related to the: 1) agency responsible for implementing the action, 2) the expected cost of the action, and 3) the timeline proposed for implementation. A review of the plan quality literature has not indicated implementation information being measured in quite this way before. The summary statistics show a low mean (1.59) for pieces of implementation information and a maximum value of 12, which is well below the possible maximum of 48 pieces of information.

4.5.b. Independent Variables: The independent variables used to predict the three categories of planning outcomes were selected based on a review of numerous plan quality studies, which included more than a dozen regression models predicting various measures of plan quality (Berke and Godschalk 2009). Many of these papers are in the hazard mitigation domain. The statistical significance and direction of independent variables used in past studies were reviewed to determine which variables should be included in the models. Variables showing a consistent pattern of statistical significance in the literature were picked for use in this study. The variables fit into the three conceptual dimensions described in Chapter 3: state policy context, local community characteristics, and local planning process. Table 4.5 provides the definitions, summary statistics, and data source for each. [See Appendix I for more detailed summary statistics and description of each independent variable, as well as a brief review of other variables considered for inclusion in the analysis].
Table 4.5: Independent Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
<th>Summary Statistics (n is for jurisdiction)</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>State Policy Context</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Planning Mandate</td>
<td>Three-level measure of whether State requires local comprehensive plan for local jurisdictions (Mandate with hazards element; mandate with no hazard element; no mandate)</td>
<td>Mandate w/ Haz: n=90</td>
<td>Institute for Business and Home Safety (2009)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mandate w/o Haz: n=30</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non-Mandate: n =55</td>
<td></td>
</tr>
<tr>
<td><strong>Local Planning Process</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local Planner</td>
<td>Three-level categorical measure of the level of local planner involvement in planning process (Jurisdiction’s own planner, other jurisdiction’s planner, or no planner)</td>
<td>Juris. Own.: n=62</td>
<td>Supplemental Plan Content Analysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other-Juris.: n=64</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>No Planner: n=49</td>
<td></td>
</tr>
<tr>
<td>Steering Committee Diversity</td>
<td>Number of 22 different categories of stakeholder groups represented on planning steering committee.</td>
<td>Mean: 7.47 s.d. 3.85</td>
<td>Plan Content Analysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Range: 0 to 18</td>
<td></td>
</tr>
<tr>
<td><strong>Local Community Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Population Density</td>
<td>The number of persons per square mile of land area</td>
<td>Mean: 775.7 s.d.: 935.5</td>
<td>US Census (2000)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Range: 3.7 to 7,825.2</td>
<td></td>
</tr>
<tr>
<td>Population Growth</td>
<td>The percent change in population in the 10 years prior to the date of plan adoption</td>
<td>Mean: 17.1 s.d.: 26.9</td>
<td>US Census (2000)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Range: -18.0 to 163.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Range: $30,400 to $1,000,001</td>
<td></td>
</tr>
<tr>
<td>Previous Disaster Experience</td>
<td>Number of Presidentially Declared disasters in the 10 years prior to the date of plan adoption</td>
<td>Mean: 3.30 s.d.: 2.21</td>
<td>Public Entity Risk Institute</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Range: 0 to 10</td>
<td></td>
</tr>
</tbody>
</table>

One variable was used to measure state policy context. Whether or not a state has a planning mandate has been used extensively in the plan quality literature and findings consistently indicate that state planning mandates are associated with higher plan quality (Berke and French 1994, Berke et al. 1996, Burby and May 1997.). Four variables were used to measure the local community
characteristics. First, previous studies of hazard mitigation plan quality have found a negative association of higher population density (Dalton and Burby 1994 and Burby and Dalton 1994), although other studies have found no significant association (Berke et al. 1996). Because of the distribution of population densities in the data, a log transformation was used for the regression models. Second, previous research has found mixed results for the impact of population growth on hazard mitigation plan quality. Norton (2005b) found a positive association while Burby (2003) detected no statistically significant association. Studies that have sought to measure demand for development more directly (e.g. through surveys of local officials) have also found mixed results, with positive, negative and insignificant associations with hazard mitigation plan quality (Dalton and Burby 1994, Burby and Dalton 1994, Berke et al. 1996, Burby 2003, Brody 2003, and Norton 2005b).

Third, multiple studies of hazard mitigation plan quality have found community wealth to be a positive predictor of plan quality in regression models (Burby and Dalton 1994, Berke et al. 1996, Berke et al. 1999), although some studies have not found a significant effect in regression models (Dalton and Burby 1994, Berke et al. 1996). Fourth, some studies have found previous experience with disasters to influence hazard mitigation plan quality (Burby and Dalton 1994, Burby 2003). However, variations in the construct used to measure previous experience and variations in the sign and significance of variables makes it difficult to detect a clear pattern. The number of presidentially declared disasters over the 10 years prior to the adoption of the plan was used in this study.

Two variables were used to measure the local planning process: involvement of local planners and diversity of groups on the planning steering committee. The diversity of the types of groups included on the official planning steering committee captures the range of groups involved in the hazard mitigation planning process and involvement of a wider range of groups has been found to positively influence plan quality (Burby 2003.) Local planners were defined as those individuals representing a county or municipal planning agency or department and the individuals responsible for
planning and zoning. Planner involvement was measured as a categorical variable with three categories: jurisdiction’s own planner, other jurisdiction’s planner, and no planner. Given that the dependent variables were measured for individual jurisdictions (typically involved in multi-jurisdictional planning processes), it was important to distinguish whether or not the planner is the jurisdictions’ own planner or a planner from another jurisdiction. For example, consider the case of the plan for the New Hanover County (NC) and the City of Wilmington and Towns of Carolina Beach and Kure Beach that all participated in the county-led planning process. If the land use approach observation is for the City of Wilmington, then it there is a jurisdiction’s own planner if there is a planner that works for Wilmington on the official committee. If there is a planner from New Hanover County, Carolina Beach or Kure Beach, that the observation is considered as having an other jurisdiction’s planner. Making this distinction allowed for differentiation between the influence of planners generally (other jurisdiction’s planner) and the particular influence of having a planner with knowledge specific to a jurisdiction (jurisdiction’s own planner).

**Phase 2: Case Study Analysis**

The remaining sections of this chapter review the sample selection, data collection, data analysis and variables for the case study analysis phase of the research. There are multiple data sets used in the case study analysis, including web-based surveys, semi-structured interviews, and document review. The sampling, data collection, and preliminary data analysis are discussed in full for a dataset (e.g. the web-based surveys) before moving on to the next dataset (e.g. the semi-structured interviews).

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6 Many smaller municipalities do not have a stand-alone planning agency or department but do have a zoning administrator or specialist. These zoning-oriented officials were counted as planners for the purposes of this analysis because I am more interested in those individuals that bring a land use-orientation to the hazard mitigation planning process than a more narrowly defined planner, such as one with a degree from a planning department or American Institute of Certified Planners status. Building department officials, floodplain managers, and code enforcement officials are not considered planners here, although they are often in administratively located in related agencies or departments. Also, consultants were not counted as planners, although some of the consultants are likely trained as planners. This choice was made for two reasons. First, this study is interested in the local land use oriented knowledge in particular. Second, from a measurement standpoint, the plans vary widely in terms of the amount of information they provide about the consultants involved.
Case study analytical methods synthesizing all of the datasets are discussed after presenting each dataset individually.

**4.6. Phase 2 Sample Selection:** The sample selection process included selection of the jurisdictions in which to conduct the survey and selection of the stakeholders within the jurisdictions to administer the survey questionnaire.

*4.6.1. Jurisdiction Selection for Case Studies:* Selecting the jurisdictions for case study analysis consisted of narrowing the sampling frame of 175 jurisdictions in the six states to a sample of four counties in two states. The major objective in selecting the cases was to ensure variation across key network-related variables, while controlling for other variables in the conceptual framework.

*4.6.1.1: Selection of Jurisdictions in which to Conduct Surveys:* Starting with the sampling frame of 175 jurisdictions from six states used in Phase 1 of the dissertation, the sample frame was first narrowed to the jurisdictions in the four southeastern states (Florida, Georgia, North Carolina and Texas). These four states were selected because they share a primary concern with climatic hazards (especially hurricanes and floods), whereas California and Washington have an additional strong focus on geologic hazards (earthquakes, tsunamis, and in some locations, volcanoes). Florida and North Carolina both have strong planning contexts, while Georgia and Texas have weak planning contexts. Research related to this dissertation indicates that Florida and North Carolina have taken very different approaches to fostering local hazard mitigation planning, especially in regards to the incorporation of land use approaches into mitigation (Smith, Lyles and Berke Forthcoming and Berke, Lyles and Smith www.ie.unc.edu/cscd/publications.cfm). As described at the end of this section, significant challenges were faced in developing case studies in Georgia and Texas, with an end result of no counties from those states included as cases.

Two additional factors were used to limit the pool of potential cases. First, the unit of analysis for the cases was defined as the county rather than the municipality because 80% of the 115 jurisdictions in the four states participated in county-level hazard mitigation planning processes. Treating counties as the unit of analysis eliminates one potentially confounding variable by avoiding
making comparisons between counties and municipalities. This approach still allows analysis of variations in how municipal stakeholders are embedded in county-level hazard mitigation networks. Second, only counties with plans adopted in 2009 or 2010 were considered. This decision was made because surveys of stakeholders were a key dataset being collected and the literature on generating network data from respondents makes it clear that the burden on survey respondents tends to be less when questions are asked about more recent events. The quality of the data generated tends to be greater as well. These two factors trimmed the potential pool of 115 jurisdictions down to seventeen counties with ten in North Carolina, five in Florida, two in Georgia and none in Texas. [See Appendix I for more detail on plan adoption dates by state.]

Network-related variables and control variables were used to select the four cases. The network-related variables on which variation was sought included involvement of a local planner, the official committee size, and the number of types of stakeholder groups represented on the official committee. Ensuring variation enables testing the network-related hypotheses. The first control variable, plan date, ensures that all of the plans are updates to the original hazard mitigation plan developed in response to the Disaster Mitigation Act and addresses the respondent burden issue as discussed above. The second control variable, lead agency for the planning process, ensures that the organization with lead responsibility for developing and maintaining the plan is similar from county to county; 75% of the 115 jurisdictions participated in planning processes were led by emergency management agencies. The third control variable, consultant used, ensures that all of the planning processes engaged outside assistance in developing their plan; 85% of the 115 jurisdictions participated in planning processes that engaged consultants. The final control variable, population over 100,000, was used to ensure that all of the counties had comparable levels of capacity to conduct hazard mitigation planning and implementation, such as having in-house professionalized emergency management and planning agencies or departments, which might not be the case in counties with smaller populations. It also enabled controlling at a general level for the complexity of planning issues, as each of the counties includes a mixture of urbanized, suburban and less developed areas,
which again might not be the case in less populous counties. A benefit of focusing on larger counties likely to have higher planning capacities is that there is a greater likelihood of identifying advanced practices that may be beyond the capacity of less populous counties.

As shown in Table 4.17, the selection variables result in four cases that with considerable variation on the network-related factors, but limited variation on the control variables. In addition to allowing comparisons on the network-related variables, the four counties allow for comparison within and across the state policy contexts in Florida and North Carolina. Larger networks with higher levels of planner involvement can be compared to smaller networks with lower levels of planner involvement within each state, thereby controlling for the influence of state policy context. On the other hand, the four counties allow for comparison of larger networks (Brevard and New Hanover) and smaller networks (Martin and Onslow) across states to explore the relationship between state policy context and networks.
Table 4.6: Case Study County Characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Brevard</th>
<th>Martin</th>
<th>New Hanover</th>
<th>Onslow</th>
</tr>
</thead>
<tbody>
<tr>
<td>State</td>
<td>FL</td>
<td>FL</td>
<td>NC</td>
<td>NC</td>
</tr>
<tr>
<td><em>Network-Related Planner Involvement</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local Planner From Other Jurisdiction</td>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Local Planner # Local Planner From New Hanover County</td>
<td></td>
<td>34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local Planner From Other Jurisdiction ^</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Committee Size</td>
<td>50</td>
<td>11</td>
<td>34</td>
<td>10</td>
</tr>
<tr>
<td>Total Number of Number of Types of Stakeholder Groups</td>
<td>16</td>
<td>11</td>
<td>11</td>
<td>5</td>
</tr>
<tr>
<td><em>Controls</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plan Date</td>
<td>2009</td>
<td>2010</td>
<td>2010</td>
<td>2010</td>
</tr>
<tr>
<td>Lead Agency *</td>
<td>EM</td>
<td>EM</td>
<td>EM</td>
<td>EM</td>
</tr>
<tr>
<td>Consultant Used</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Population</td>
<td>&gt;100,000</td>
<td>&gt;100,000</td>
<td>&gt;100,000</td>
<td>&gt;100,000</td>
</tr>
</tbody>
</table>

# The Martin County plan indicates that there was no local planner on the steering committee for the plan adopted in 2010, though the county growth management department was represented on the committee in the planning process for the plan adopted in 2005.

^ The Onslow County plan indicates that there was not a county planner on the steering committee, but subsequent interviews indicated that the county floodplain manager, who is administratively located in the Planning and Development department was mistakenly left off the steering committee list. However, as noted in the Onslow County case study, the county floodplain managers’ training and experience are more in emergency management and code enforcement than land use planning.

* EM denotes emergency management agency

It is important to note that the set of variables used to select these four cases closely aligns with the set of independent variables used in the regression models employed in Phase 1 of this research. This approach should allow for triangulation of the findings across both lines of analysis.

Finally, a few challenges faced in selecting the cases and collecting data merit elaboration. First, surveys were initially administered in twelve jurisdictions in addition to the four cases selected. Those jurisdictions varied widely in terms of population and included two counties in Georgia and two municipalities in Texas. Analysis of the survey response rates following all of the email contacts
(see section 4.7.b. below for more detail on the survey administration procedures) indicated that focusing follow-up phone calls on the counties with populations over 100,000 provided the greatest opportunity to carefully investigate the influence of stakeholder network diversity and structure on planning outputs, controlling for other factors. Second, as noted above, the sample of 115 jurisdictions included no counties in Texas with a plan adopted in 2009 or 2010. The two Texas municipalities that were surveyed were dropped because of low response rates and because of concerns that neither planning process was adequately comparable to the county-level planning processes. Third, the two counties in Georgia ended up having to be dropped as well. Camden County had a low response rate and the emergency management official responsible for the plan did not complete the survey. In Chatham County, the committee response rate was high enough to conduct follow-up phone calls asking respondents to complete the survey. However, after all of the follow-up phone calls were completed it was found that one-third of the individuals identified in the plan as committee members were no longer in the network or never participated in the planning process to begin with, including two of four key emergency management officials. Even after speaking with the other two emergency management officials on the phone, they did not complete the survey. Thus, the conclusion was drawn that Chatham County’s network was too unstable and would be missing information from too important a group of stakeholders to merit inclusion as a case.

4.6.a.2. Selection of Stakeholders for Web-Based Survey: Selection of the sample of stakeholders to administer web-based surveys in each of the jurisdictions consisted of a three-step process. A key issue in conducting network analysis is identifying the boundary of the network. Boundaries of networks can be thought of as being somewhat similar to contour lines on a map rather than a distinct either in the network or out of the network condition (Doreian and Woodard 1994.) Thus, a combination of positional (i.e. using a the hazard mitigation committee membership as a fixed list as

7 One municipality, Pearland, had a stand-alone plan and the other, Bay City, participated in a large, multi-county planning process. None of Pearland’s official committee members completed the survey and less than 20% of the full set of stakeholders completed the survey. Bay City’s response rate among committee members was also less than 20% and the Floodplain Administrator from Bay City refused consent to complete the survey.
a starting point) and relational approaches (i.e. using snowball sampling of stakeholders mentioned by
the committee members) was used in this study. [See Appendix I for more information on network
boundary specification].

First, the stakeholders surveyed in each jurisdiction were identified from the most recently
adopted hazard mitigation plan. Nearly all plans included the roster of all the stakeholders who
served on the official hazard mitigation planning team or committee in its description of the planning
process or in an appendix. Second, the committee members’ contact information were obtained from:
1) the hazard mitigation plan appendices, some of which include rosters with contact information
sheets or sign-in sheets from official meetings, 2) internet searches of organizational web pages to
locate email addresses and 3) contacting the individual from the regional government, county
government, municipal government or private consulting firm identified as having primary
responsibility for the maintenance of the plan and asking them to share the email addresses of
stakeholders in their community. Third, snowball sampling included reviewing the names generated
by the official committee members in their survey responses and identifying those individuals not
included in the original sample. This approach has been used in hazard-related network research
(Lind et al. 2009) and is in line with recommendations in the literature on survey methods for network
analysis discussed above.

4.7 Stakeholder Survey Data Collection: This section details the methods used to collect the
stakeholder survey data. A web-based survey instrument was sent to more than 150 stakeholders in
the four case study counties to measure aspects of the assets they bring to the hazard mitigation
planning and implementation in their community, how they have participated in the past, and what
mitigation actions they are currently working to implement.\(^8\) The survey design and administration
methods described below are in line with best practices recommended in the literature, with particular

\(^8\) The survey was sent to more than 600 stakeholders when the other ten counties and two municipalities that did
not end up as case studies are included.
attention paid to using a web survey to collect data useful in network analyses (Couper 2008, Dillman 2008, Marsden 2005).

4.7.a. Survey Questionnaire Development and Design: In December 2010 and January 2011, a web-based survey was developed to address six main questions. These questions related to each of the core research questions for this dissertation by generating information about the attributes of the individual stakeholders involved in the networks (e.g. assets, participation, and ongoing implementation) and the patterns of relationships in the network (e.g. who stakeholders receive information from). The six questions were:

1. What assets do you bring to the hazard mitigation planning process (e.g. experience, skills, and beliefs)?

2. How often did you participate in the process of developing your community’s hazard mitigation plan?

3. From whom do you obtain information related to hazard mitigation planning in your community?

4. What preventative land use-oriented mitigation actions are you working to implement in 2011?

5. How often do you use your community’s hazard mitigation plan?

6. Can you identify any hazard mitigation champions in your community?

Similar questions have been used in previous studies that examined stakeholder networks in the environmental management and planning policy arena. Lubell, McCoy and Henry at UC-Davis focused on understanding land use and transportation stakeholder networks in California (Lubell, Henry and McCoy 2010 and Henry, Lubell and McCoy 2011). Scholz and colleagues at Florida State focused on understanding estuarine management (2008). The survey questionnaires from both studies were obtained and specific questions have been replicated here to the greatest extent possible, while modifying them to be applicable to hazard mitigation. Using the UC-Davis and Florida State University surveys as starting point, the survey questionnaire was developed following the
recommendations in Dillman (2008) and Couper (2008) related to question wording, response formats, question order, and questionnaire layout and design.

Measurement of networks poses numerous challenges requiring design-related decisions by researchers (Marsden 1990 and 2005). Web-based network surveys can pose special challenges for collecting data on relationships between stakeholders, particularly as compared to using in-person interviews (Vehovar, Manfreda, Koren and Hlebec 2008, Lozar Manfreda et al. 2004). A key challenge faced in this study was stimulating respondents’ memories to reduce the chance they forget to name other stakeholders, while also reducing the burden on stakeholders of providing the names of the stakeholders. A recall approach was taken to overcome the tendency of respondents to forget. A series of prompts were also included to follow-up on an initial free-recall question. [See Appendix I for more detail on the recall approach, follow-up prompts and other design decisions made to address challenges of generating reliable network data. See Appendix VII for the survey questionnaire.]

4.7.b. Survey Questionnaire Administration: A key challenge related to generating network statistics from survey data guided the process of administering the survey question. Namely, when seeking to conduct network analysis at the whole network level, sampling of respondents cannot be used (Marsden 1990 and Doreian and Woodard 1992). The patterns of stakeholder relationships are interdependent such that when stakeholders and the relationships they identify are missing the network statistics for all stakeholders in the network may be affected. Thus, a first challenge in network-oriented surveys is to obtain as close to a census of stakeholders as possible, which was done using the procedures described below. When stakeholders did not respond, considerable effort was taken to identify why they did not reply. [See Appendix I for more detail on these efforts].

Survey questionnaire administration procedures were developed in line with Dillman (2008). Key elements of the administration procedures include internally pre-testing the survey questionnaire and web-survey software, identifying an incentive to encourage response, review by the Institutional Review Board, pre-testing in a sample of respondents as comparable as possible to the main sample,
using a mixture of modes to contact respondents, and monitoring the survey administration to identify and address any problems that arise.

4.7.b.1. Pre-Testing and Institutional Review Board Approval: The survey instrument and administration procedures were tested internally using a sample of graduate students. Subsequently, two rounds of external testing were conducted with hazard mitigation stakeholders in counties similar to those in the main sample. The first round of pre-testing included Pasco County, FL, Pinellas County, FL, and Carteret County, FL, while the second round included Volusia County, FL. IRB approval was obtained for all external testing and for conducting the survey with the main sample. [See Appendix I for more detailed explanation of pre-testing procedures.]

4.7.b.2. Survey Questionnaire Administration: Survey questionnaire administration procedures followed recommendations in Dillman (2008) including employing multiple modes of communication (email and phone) and multiple follow-up requests to complete the survey. Throughout the winter and spring of 2011, lists of official hazard mitigation planning committee members and other stakeholders were extracted from the plans for the jurisdictions in the sample. The initial emails with the survey links were sent in July 2011 and the survey process was considered complete in December 2011. [See Appendix I for more detail on collection of email addresses, the timeline of survey administration, and the effectiveness of follow-up contacts in driving up response rates.]

Response rates for committee officials range between 62.5% and 77.8% for the four jurisdictions (see Table 4.18). The effect of non-response on network statistics generated from survey data depends upon the specific network statistics being calculated (Kossinets 2006). Given the responses rates observed in this study, the network data were treated as suitable for exploratory analysis and useful for hypothesis evaluation in combination with other data sources on the networks.

An additional step taken to understand the potential implications of missing was to assess which stakeholders did not respond to the survey. This analysis was done on a stakeholder-by-stakeholder basis and provided insight into whether any obviously key stakeholders were missing and
if there were trends across the non-responding stakeholders (e.g. most represent a particular government level or have a particular professional expertise.) Across the counties, a mix of county and municipal officials and other stakeholders did not respond. [See Appendix I for a county-by-county breakdown of the non-respondents.] Committee members considered essential for understanding the mitigation networks (e.g. county emergency management officials responsible for mitigation) or connections between emergency managers and local planners (e.g. county planning officials) were not among the non-respondents.

**Table 4.7. Survey Response Rates for Four Case Studies**

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Total Number of Emails</th>
<th>Committee Members in Network</th>
<th>Committee Respondents (8-15-11)</th>
<th>Preliminary Response Rate</th>
<th>Committee Respondents (Jan. 1, 2012)</th>
<th>Final Committee Response Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brevard County, FL</td>
<td>45</td>
<td>39</td>
<td>15</td>
<td>38</td>
<td>25</td>
<td>64.1</td>
</tr>
<tr>
<td>Martin County, FL</td>
<td>10</td>
<td>9</td>
<td>4</td>
<td>44</td>
<td>6</td>
<td>66.7</td>
</tr>
<tr>
<td>New Hanover County, NC</td>
<td>96</td>
<td>32</td>
<td>19</td>
<td>59</td>
<td>20</td>
<td>62.5</td>
</tr>
<tr>
<td>Onslow County, NC</td>
<td>10</td>
<td>9</td>
<td>4</td>
<td>44</td>
<td>7</td>
<td>77.8</td>
</tr>
</tbody>
</table>

4.7.c. Analysis of Survey Data: Analysis of the survey data consisted of analyzing the responses to questions related to individual stakeholder attributes (i.e. those questions used to generate the stakeholder network visuals and statistics) and analyzing the responses to stakeholder network questions used to generate network visualizations and statistics.

4.7.c.1. Analysis of Individual Attribute Questions: Individual attribute questions consisted of those questions dealing with the assets individuals bring to the planning process (professional specialization, years of experience, skills and authorities, and beliefs), the frequency of participation in the planning process, actions the stakeholder was working to implement in 2011, and the frequency of use of the plan as a reference document. For each of the individual attribute questions descriptive
statistics were generated. Due to the small sample size of networks, especially Martin County and Onslow County, test of the significance of differences across jurisdictions could not be meaningfully interpreted. [See Appendix VI, Tables VI.2 through VI.5 for tabulations of individual attribute questions by county.]

4.7.c.2. **Analysis of Stakeholder Network Questions:** Stakeholder network questions consisted of asking respondents to identify stakeholders from whom they received hazard mitigation-related information and the follow-up prompts designed to generate a deeper and broader array of stakeholder names from the respondents. Analysis of the stakeholder network questions consisted of 1) generating adjacency matrices of un-weighted, undirected connections between stakeholders; 2) creating visual representations of the network from the adjacency matrices; and 3) generating networks statistics from the adjacency matrices. [See Appendix I for more information on how the adjacency matrices, visual representatives, and network statistics were generated.]

4.8 **Semi-Structured Interviews:** Semi-structured interviews with key county and municipal-level mitigation stakeholders were conducted following recommendations on conducting interviews for use in qualitative research (Seidman 2006).

4.8.a. **Selection of Semi-Structured Interview Sample:** Selection of key stakeholders to conduct semi-structured interviews with was based on a desire to examine three factors: 1) the roles individuals filled in the planning process, 2) the professional specialization and organization represented, and 3) stakeholders in highly central positions in the network. [See Appendix I for additional considerations in selecting interviewees.]

The planning process roles of interest included those individuals with official responsibility for overseeing the hazard mitigation planning process and those individuals with daily responsibility for managing and supporting the planning process through tasks such as contacting stakeholders, conducting analysis, and writing the plan. The professional specializations and organizations of primary interest included 1) emergency managers, particularly the designated hazard mitigation coordinator (if there was one) and the head of the emergency management agency or department and
2) local planners, including those representing planning agencies or departments and those responsible for zoning administration. While most of the emergency managers interviewed were included in the hazard mitigation planning processes, some of the planners were not. In these cases the interest was in learning about why they did not participate in the hazard mitigation planning process. Highly central stakeholders were identified from the survey responses. For the most part, the stakeholders captured by the planning process role and professional specialization categories were the most central stakeholders. The list of interviewees also included other professional specializations: fire/rescue, floodplain management, natural resource, and regional planning.

4.8.b. Semi-Structured Interview Data Collection: Collection of semi-structured interview data included developing and pre-testing an interview protocol, obtaining IRB approval for the interview protocol and administration process, scheduling and conducting the interviews, and content analyzing the interview responses. The semi-structured interviews included questions related to two main topics:

1. The individual’s perceptions of the hazard mitigation stakeholder network and,

2. Efforts to implement the hazard mitigation plan.

The implementation-oriented section of the interview protocol was customized for each interview to ask about the specific actions included in the mitigation plan that the interviewee’s agency or department was identified in the plan as responsible for or for which it seemed likely to have responsibility. The interview protocol is included in Appendix VII.

4.8.b.1: Interview Protocol Development and Approval: In the summer of 2011 the interview protocol was developed, using an interview protocol administered to state mitigation officials in the DHS-funded study as a reference (Smith, Lyles, and Berke Forthcoming.) The questions were developed to complement the survey data by digging more deeply into the network diversity and structure, how stakeholders perceive the networks and their positions in the networks, and, more specifically, how connected local planners and emergency managers are. Questions were developed to gain a more nuanced understanding of if and how stakeholders are working to implement the plan,
especially in regards to land use actions, as well as how respondents do or do not use the adopted plans to inform or guide mitigation-related decisions. The protocol and administration procedures were approved by the IBR in October 2011.

4.8.b.2. Interview Scheduling and Administration: Interviews were scheduled through email and phone contacts. When possible, the interviews were conducted in person at the respondent’s office. When in-person administration was not possible, interviews were conducted over the phone.9 Respondents were sent the primary interview questions in advance of the appointment. Also, notes were taken during and after the interviews. Interviews with twenty-three individuals were conducted during site visits in December 2011 (six individuals from four agencies in New Hanover County, NC and eight individuals from five agencies10 in Onslow County, NC) and January 2012 (four individuals from three agencies in Brevard County, FL and five individuals from four agencies11 in Martin County, FL). Interviews were recorded electronically and transcribed using a transcription service.

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9 One respondent declined to conduct an in-person or phone interview, but did type responses to each of the interview questions and return those responses via email. Another person in the same agency was interviewed in person.

10 One of the eight stakeholders was interviewed in January 2012 over the phone.

11 One of the five stakeholders answered the interview questions in December 2011 via email.
Table 4.8. Agencies Whose Representatives Were Interviewed

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Agencies Whose Representatives Were Interviewed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brevard County, FL</td>
<td>Brevard County Emergency Management (two individuals)</td>
</tr>
<tr>
<td></td>
<td>Brevard County Natural Resources Management (one individual)</td>
</tr>
<tr>
<td></td>
<td>City of Palm Bay Utilities (one individual)</td>
</tr>
<tr>
<td>Martin County, FL</td>
<td>Martin County Emergency Management (two individuals)</td>
</tr>
<tr>
<td></td>
<td>Martin County Growth Management (one individual)</td>
</tr>
<tr>
<td></td>
<td>Treasure Coast Regional Planning Council (one individual)</td>
</tr>
<tr>
<td></td>
<td>City of Stuart Fire Rescue (one individual)</td>
</tr>
<tr>
<td>New Hanover County, NC</td>
<td>New Hanover County Emergency Management and 911 Communications (two individuals)</td>
</tr>
<tr>
<td></td>
<td>New Hanover County Health (one individual)</td>
</tr>
<tr>
<td></td>
<td>New Hanover County Planning and Inspections (two individuals)</td>
</tr>
<tr>
<td></td>
<td>City of Wilmington Development Services (one individual)</td>
</tr>
<tr>
<td></td>
<td>Town of Carolina Beach Planning and Development (one individual)</td>
</tr>
<tr>
<td>Onslow County, NC</td>
<td>Onslow County Emergency Services (two individuals)</td>
</tr>
<tr>
<td></td>
<td>Onslow County Planning and Development (two individuals)</td>
</tr>
<tr>
<td></td>
<td>Onslow County Geographic Information Systems (one individual)</td>
</tr>
<tr>
<td></td>
<td>City of Jacksonville Fire Department (two individuals)</td>
</tr>
<tr>
<td></td>
<td>Town of North Topsail Beach Planning Department (one individual)</td>
</tr>
</tbody>
</table>

4.8.c. Interview Content Analysis: The transcripts of the interviews were content analyzed to identify information and quotes related to seven main themes. Each of transcripts was read and for each quote from the interviewee the relevant theme or themes was noted in the margin. A master list was created for each transcript of all the quotes related to each of the seven themes, which was then used in the case study analysis process. The seven main themes are discussed in Section 4.10 below.

4.9 Secondary Document Selection, Collection and Analysis: This section outlines the process of selecting, collecting and analyzing secondary documents used in the case study analysis.

4.9.a: Secondary Document Selection: The purpose of reviewing secondary documents was to understand each jurisdiction’s official plans and policies related to hazard mitigation and land use planning. Two main types of documents were reviewed. First, the hazard mitigation plans were included because they are the primary output of the hazard mitigation planning processes. The plans included important information about the network of stakeholders involved in the planning process and the incorporation of land use into hazard mitigation. Second, adopted comprehensive plans were
included because, in many communities, they are the central expression of goals, objectives and strategies to achieve a long-term vision. The comprehensive plans included important information about the broader network of stakeholders engaged in local planning. Many comprehensive plans have elements directly or indirectly addressing natural hazard mitigation, including coastal management elements.

4.9.b: Secondary Document Collection: The secondary documents were collected through two main ways. Most documents were available on the official websites of the county, municipal, and regional agency websites in the case study locations. A small number of documents were not publicly available online or were only available in a format difficult to read and analyze. Those documents were obtained through contacts with local officials in the case study locations. The hazard mitigation plans were collected as part of the larger DHS-funded study in 2009 and 2010. The other documents were collected in the fall of 2011 through the winter of 2012.

4.9.c: Secondary Document Analysis: Protocols with specific prompts were developed for analysis of the hazard mitigation plans and comprehensive plans. Each of the protocols focused on identifying information related to the stakeholder networks involved in the planning process and ongoing implementation of the plan. Key parts of the plans for finding this information were the sections or chapters describing the participation process, the lists of official committee members and other stakeholders, meeting minutes when available, incorporation of land use into the fact base and mitigation strategy sections, and the implementation information related to who is responsible for implementing specific actions and monitoring and updating the plan. Each of the protocols also focused on identifying linkages between hazard mitigation, land use, and emergency management.

[See Appendix VII for protocols.]

4.10. Case Study Analysis: The case study analysis consisted of two phases: analysis of each of the four cases individually and then cross-case analysis.

4.10.a. Individual Case Analysis: The individual case study analysis included integration of the data sets described above to triangulate on the influence of stakeholder networks on land use-related
hazard mitigation planning outputs. It consisted of addressing seven main themes selected and building explanations of the interplay of the key dimensions from the conceptual framework in Chapter 3 (Yin 2008). In each of the four case studies, the seven themes were addressed individually followed by a concluding section that summarized key findings. The first two themes comprised the dependent variables, while the last five themes comprised the independent variables.

The first and second theme sections of the case studies addressed the land use-related mitigation outputs – the dependent variables. The hazard mitigation plan quality theme section drew on the plan document and interviews to assess the degree to which land use approaches to mitigation were addressed for three principles of plan quality. The three principles were fact base (i.e. assessment of land use capabilities), policies (i.e. land use approaches included in the mitigation strategy) and implementation (i.e. amount of information about how the individual land use actions will be implemented once the plan is adopted and information about how the mitigation plan will be incorporated into other planning processes.) The second theme section focused on implementation of land use approaches to mitigation, drawing on survey responses and interviews. Implementation conformance was assessed from interviews by identifying the amount of progress that has been made implementing the specific land use-related actions included in the hazard mitigation plan mitigation strategy sections. A broader assessment of ongoing implementation of land use approaches to mitigate hazards was generated from survey responses and interview data. This assessment was not limited to implementation of actions from mitigation plans (i.e. plan conformance) and included implementation of land use related actions with mitigation benefits regardless of whether the actions were included in the mitigation plan or not.

The five independent variable theme sections of the case studies addressed the characteristics of the local community, planning process, and stakeholder network, in line with the main dimensions of the conceptual framework. As each theme was explored, the narrative described how the independent variables help explain the observations on mitigation plan quality and ongoing implementation. The first independent variable theme section, the case setting or local community
context, drew on the plan document, interviews and secondary data to describe the counties’ socio-economic characteristics, political climate around growth and development issues, and experience with natural hazard events and losses. Next, the hazard mitigation plan development and update process theme section drew on the plan documents and interviews to provide a narrative summary of the process used to develop the original Disaster Mitigation Act of 2000-compliant mitigation plan between 2003 and 2005 and the process of updating that plan in 2009 and 2010. Key points of emphasis are the role of local emergency managers, involvement of local planners, consultants, and the general public, and differences between the 2003-2005 planning process and the 2009-2010 planning processes.

The mitigation stakeholder network diversity theme section drew on survey responses and interviews to describe the diversity of organizations involved in the mitigation network and to identify the assets that steering committee members brought to the planning process. Key assets of interest were professional specialization, experience working on mitigation, skills or authorities and views on the effectiveness of preventative land use approaches to mitigation. Then, the mitigation stakeholder network structure theme section drew on survey responses and interviews to describe and visualize the overall structure of the network, which enabled identifying whether the network structure exhibited preferential attachment (i.e. opinion-leader and hierarchical network structures) or more of a balance of bridging and bonding ties (i.e. small world and village networks). The data enabled descriptive and statistical analysis of the relative centrality of positions of key stakeholders in the overall network structure. Additionally, the interviews in particular were used to develop an understanding of how the network structure has evolved over time and federal, state and local factors that have driven the changes in the networks. Finally, the bridging the emergency management – land use planning expertise boundary theme section drew on the plan document, survey responses and interviews to identify the degree to which the local emergency managers and local planners are connected to each other. The analysis included connections on mitigation efforts, but also
connections more broadly focused on other ongoing efforts and how the connections have changed over time.

The concluding section of the individual case studies summarized the key findings across the seven themes. Particular attention was paid to explaining linkages between the independent and dependent variables and identifying the influence of federal and state efforts to coordinate local mitigation.

4.10.b. Cross-Case Analysis: The cross-case analysis consisted of pattern matching across the four cases to answer the research question and test the hypotheses laid out in Chapter 3 (Yin 2008). It consisted of two main parts. First, the influence of the independent variables, particularly the network structure and bridging of the emergency manager–local planner expertise gap, was compared across the four cases. The influence of state policy contexts and local community characteristics was accounted for in the comparison. Particular attention was paid to the comparisons within the states (Brevard County vs. Martin County in Florida and Onslow County vs. New Hanover County in North Carolina) to control for the state policy context and explore the relationships between local community characteristics, stakeholder networks and planning outputs. Similarly, comparisons were made across the states (Brevard County and Martin County vs. Onslow County and New Hanover County) to allow comparisons across the two different state policy contexts.

Second, the hypotheses from Chapter 3 were revisited and the conclusions drawn from the individual cases and cross-case analysis were coupled with the regression results to indicate whether the evidence supports or refutes the hypotheses. Comparisons were made for each of the four main planning outputs evaluated in this dissertation: 1) assessment of land use capabilities (i.e. fact base principle of plan quality); 2) inclusion of land use actions in mitigation strategy (i.e. policies principle of plan quality); 3) inclusion of implementation information for land use actions (i.e. implementation principle of plan quality); and 4) ongoing implementation of land use approaches to mitigation.
4.11. Omitted Variables

There are other variables that have either been theorized or empirically demonstrated to influence hazard mitigation planning outcomes that are not included in this study or are addressed in the case studies but not the regression models. In most cases the omissions are due to data limitations. Where possible, the open-ended data collection techniques in the case studies, especially semi-structured interviews, will be used to explore these variables.

The first set of potentially omitted variables relates to the politics of disasters, particularly the local political context and whether it is dominated by conflict between competing advocacy coalitions (Olson 2000, Prater and Lindell 2000, and Sabatier and Jenkins Smith 1993). Conflict may occur between advocates of local control and advocates of state or regional control or between economic interests and environmental interests (Norton 2005b). These types of conflicts may result in dominance of an anti-mitigation coalition that opposes land use approaches that limit in or direct development away from hazardous areas. Yet, the general trend in the research is to understand hazard mitigation as an issue with low political salience. That is, public interest and participation in hazard mitigation planning processes tends to be very limited, rather than the venue for resolving politically charged conflicts (Prater and Lindell 2000, Godschalk, Brody and Burby 2003). Additionally, in the sample of 175 jurisdictions non-governmental stakeholders were infrequently involved. For example, the plans for 17 jurisdictions included neighborhood groups, 6 included developers or homebuilders groups, and 5 included environmental groups. The lack of public involvement is explored further in the case studies through the surveys and interviews, which offers opportunities to discern differences in how these competing interests are or are not engaged in the hazard mitigation planning stakeholder network.

A second set of omitted variables relates to other relationships between mitigation stakeholders beyond information sharing and collaboration that may influence hazard mitigation planning outputs. That is, maybe this dissertation focuses on the wrong set of relationships between stakeholders. Perhaps strategic relationships (e.g. crafting political alliances or doing or asking for
favors) are more important than information sharing and collaboration in influencing outputs. To the extent that hazard mitigation planning outputs tend to fall into the category of plans collecting dust on shelves, they are unlikely to be highly influenced by strategic relationships because for most stakeholders the payoff is not there for the effort required, especially when compared with engaging in other aspects of comprehensive planning, individual development proposals, or political campaigns more generally. Also, some of the research methods employed in this study (e.g. semi-structured interviews with key stakeholders) may expose other types of relationships as important.

A third omitted variable, at least in the regression modeling, is the role of consultants – mostly private contractors but in some cases regional planning organizations – that assist local officials with their planning processes. Although not all mitigation plan documents in the sample explicitly acknowledge the role played by consultants in the planning process, most plans did exhibit evidence of consultant involvement. Due to the fact that plans varied widely in how they acknowledged whether consultants were used to develop the plan, it was not possible to develop a reliable quantitative measure of consultant involvement, even a simple binary variable for consultant involvement or no consultant involvement. However, the case studies account for the important roles played by consultants, including how they interacted with local stakeholders, the professional specializations/training of the individual consultants and the strengths and weaknesses of the features of the document template used by the consultants.

A fourth omitted variable is the relative physical exposure of the community to hazards. This variable has been conceived of as the area of a community that is hazardous for development (Burby and Dalton 1994, Dalton and Burby 1994, and Berke et al. 1996). However, the amount of hazardous area has been found to have a significant influence on hazard mitigation planning outputs only once (e.g. a positive effect) in more than a half-dozen regression models in these studies.

Finally, since this research is cross-sectional, there are numerous longitudinal factors that cannot be adequately addressed. Conceptual dimensions that may influence hazard mitigation planning outputs that are not considered included: changes to the federal, state and/or local political
context over time (e.g. new administrations with new priorities for rules or interpretations of rules) and hazard events that occur during the research process, which may change priorities or alter the ability of stakeholders to engage in mitigation. A longitudinal factor that the case studies address is changes to the makeup of the hazard mitigation stakeholder networks. Changes may be triggered by factors internal to the local jurisdiction (e.g. staff turnover and agency reorganizations) and external to the local jurisdiction (e.g. recency of a major hazard event and fluctuations in federal post-disaster grant funds). Such changes may serve to strengthen or weaken the network as individuals with varying experiences, beliefs and skills shift in and out of the network over time.
Chapter 5

Predicting the Incorporation of Land Use into Hazard Mitigation Plans

The central hypothesis tested in this chapter is that inclusion of local planners in hazard mitigation stakeholder networks will lead to greater incorporation of land use approaches in hazard mitigation planning outputs, controlling for the state planning policy context, the local community characteristics, and the diversity of the stakeholder network in the planning process. This hypothesis incorporates the conceptual dimensions from Chapter 3 (see Figure 3.1), with the exception of the network structure dimension and the planning outcomes dimension. The influence of the network structure dimension is not assessed in this part of the dissertation because of data limitations, but is addressed in detail in the case studies later in the dissertation.

5.1 Overview of Regression Models

Three regression models are used to test the hypothesis stated above. The dependent variables used in this chapter consist of the incorporation of the same set of 16 different land use approaches to mitigation into the fact base, policies and implementation principles. The fact base and policies principles lay the direction-setting foundation for a community’s approach to hazard mitigation and the implementation principle provides tangible action-oriented information about how the proposed policies will be implemented. These three principles are also the principles most likely to include land use actions in hazard mitigation plans.¹

¹ Data for the other four principles – goals, participation, inter-organizational coordination, and monitoring – indicated limited attention to land use. Analysis of the incorporation of land use into these other four principles would provide little insight because there is limited variation to model.
The first dependent variable is a continuous measure of the assessment of existing land use approaches in the fact base of hazard mitigation plans. The second dependent variable is a count of the number of land use policies (or actions) included in the mitigation strategy of the hazard mitigation plan. The third dependent variable consists of the implementation information for each of the proposed land use policies. Three types of implementation information are included: identification of an agency responsible for implementation, identification of a project cost for implementation, and identification of a timeline for implementation. The order of presentation of the regression models in this chapter fits with the logic of hazard mitigation plans. The fact base typically precedes and informs the proposal of policies, which in turn precede provision of information about how the policies will be implemented.

The specific form of the regression models varies to suit the data generation process of the dependent variables. The data for the assessment of land use approaches in the fact base are treated as continuous in the range between 0.0 and 10.0 because the items used to generate the index were measured on an ordinal scale and provide fine-grained differentiation more in line with continuous data than count data. The proposed land use policies and implementation information data are treated as count variables because the data consist of policies (or items of implementation information) that are either present in the plan or not.

The same set of independent variables was used to predict the three dependent variables. The independent variables consist of state planning policy context, local community context, and stakeholder network diversity in the planning process variables. Table 5.1 summarizes the predicted relationships between the independent variables and incorporation of land use approaches into the three principles of plan quality. The far right column indicates hazard mitigation-related plan quality studies used to develop the predictions, while the footnotes indicate relevant findings from plan quality studies from other planning domains. In the absence of other evidence to the contrary from the literature, the pattern of influence of each independent variables is expected to be the same across the three plan quality principles (Table 5.1).
Table 5.1. Predicted Pattern of Relationships Between Independent and Dependent Variables

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Fact Base</th>
<th>Dependent Variables</th>
<th>Previous Studies with Similar Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Proposed Policies</td>
<td>Implementation Information</td>
</tr>
<tr>
<td><strong>State Planning Policy Context</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Local Community Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disaster Experience</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td><strong>Stakeholder Network Diversity in Planning Process</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jurisdiction’s Own Planner</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>Other Jurisdiction’s Planners</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>Steering Committee Groups</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
</tr>
</tbody>
</table>

² In contrast to the other studies, Burby and Dalton (1994) found a negative relationship between repeated disaster losses and inclusion of development management approaches in comprehensive plans.

³ At least one hazard mitigation related study (Brody 2003) found no significant relationships between population growth and plan quality, while studies in other planning domains have found a significant, positive relationship between population growth and plan quality (Berke et al. 2002 related to indigenous rights and Manta Conroy and Berke 2004 related to sustainable development).

⁴ At least one hazard mitigation related study (Berke et al. 1996) found no significant relationships between population density and plan quality, and one other study has found a significant, negative relationship between population density and plan quality (Brody et al. 2006 related to sprawl reducing policies).

⁵ Dalton and Burby (1994) found no significant relationship between median house value and hazard mitigation related plan quality and some models in the Berke et al. (1996) and Burby and Dalton (1994) found no significant relationship either. Berke et al. (1999) found a significant relationship in the environmental management domain, while Brody et al. (2006) found a significant, negative relationship in the domain of sprawl reducing policies.
5.2. Predicting the Incorporation of Land Use Approaches in Fact Bases

Table 5.2 includes the results of the ordinary least squares regression model explaining the assessment of existing land use approaches in the fact base of hazard mitigation plans as a function of state planning policy context, local community context, and stakeholder network diversity in the planning process variables. The explanatory power of the model is highly significant (F-statistic \( p=5.491\times10^{-9} \)) and accounts for a modest proportion of the overall variance (adjusted R-squared = 0.247).\(^6\) Multicollinearity was not found to be a concern.\(^7\) Plots of residuals did not indicate heteroskedasticity to be a major problem.\(^8\)

\(^6\) As a test of the findings over different model specifications, the model was run as a median regression also. The sign and magnitude of the variables determined to be statistically significant at the \( p<0.05 \) level in the Ordinary Least Squares model were the same, confirming the core findings of the OLS model. In the median regression model, the jurisdiction specific planner variable was positive and statistically significant at the \( p=0.070 \) level. The steering committee groups variable was negative and statistically significant at the \( p=0.072 \) level. These two findings fall in the marginal area between the commonly accepted confidence levels (e.g. \( 0.1>p>0.05 \)). Thus, these findings suggest the potential influence of local jurisdiction-specific planners and steering committee group diversity, but do not provide strong support.

\(^7\) None of the variance inflation factors were higher than 1.2.

\(^8\) As a further check beyond the eyeball test of the residual plot, a Bruesch-Pagan test was performed. The test produced a \( p \)-value of 0.077, putting the concern about heteroskedasticity in a gray area. As a test of the robustness of the unadjusted model, the model was run with robust standard errors. The pattern of signs, magnitudes and statistical significances were similar across the independent variables, with the exception of the jurisdiction-specific planner variables. In the model with robust standard errors, the jurisdiction specific planner variable is statistically significant at the \( p=0.058 \) level and has a positive coefficient. Because the Bruesch-Pagan test results were in a range open to multiple interpretations and because the confidence in the jurisdiction-specific planner coefficient was not very strong (e.g. \( p>0.05 \)), it was decided to stick with the unadjusted model, which has a more conservative interpretation of the influence of local planners. The magnitude of the effect of jurisdiction-specific planners in the adjusted model is one-quarter of the size of the effect of the mandate requiring a hazard element variable and one-half the size of the effect of the mandate without a hazard element requirement, meaning that the planner variable is not as strongly associated with assessing land use capabilities.
Table 5.2: Explaining Assessment of Land Use Approaches in Fact Base

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>z-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>**State Planning Policy Context *</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mandate with Hazards</td>
<td>1.074</td>
<td>0.147</td>
<td>7.310</td>
<td>0.000 ***</td>
</tr>
<tr>
<td>Mandate w/o Hazards</td>
<td>0.684</td>
<td>0.197</td>
<td>3.463</td>
<td>0.001 ***</td>
</tr>
<tr>
<td>**Local Community Characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Population Density (logged)</td>
<td>-0.031</td>
<td>0.040</td>
<td>-0.775</td>
<td>0.439</td>
</tr>
<tr>
<td>Number of Presidentially Declared Disasters in 10 years Prior to Plan Adoption</td>
<td>-0.071</td>
<td>0.029</td>
<td>-2.473</td>
<td>0.0144 *</td>
</tr>
<tr>
<td>Population Growth in 10 years Prior to Plan Adoption</td>
<td>-0.001</td>
<td>0.002</td>
<td>-0.635</td>
<td>0.526</td>
</tr>
<tr>
<td>Median House Value</td>
<td>-3.1 e-7</td>
<td>4.1 e-7</td>
<td>-0.762</td>
<td>0.447</td>
</tr>
<tr>
<td>**Stakeholder Network Diversity in the Planning Process **</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jurisdiction’s Own Planner</td>
<td>0.197</td>
<td>0.152</td>
<td>1.294</td>
<td>0.197</td>
</tr>
<tr>
<td>Other Jurisdiction’s Planner</td>
<td>0.183</td>
<td>0.157</td>
<td>1.162</td>
<td>0.247</td>
</tr>
<tr>
<td>Steering Committee Groups</td>
<td>0.004</td>
<td>0.016</td>
<td>0.259</td>
<td>0.796</td>
</tr>
<tr>
<td>Intercept</td>
<td>0.588</td>
<td>0.254</td>
<td>2.317</td>
<td>0.022 *</td>
</tr>
</tbody>
</table>

Significance codes:  0 ‘****’ 0.001 ‘***’ 0.01 ‘**’ 0.05 ‘.’ 0.1
F-statistics 7.357 on 9 and 165 DF
p-value 5.49 e-9
Multiple R-Squared 0.2864
Adj. R-Squared 0.247
n 175

* The reference category for the three-level state mandate variable is no state mandate for local comprehensive planning. California, Florida and North Carolina are Mandate with Hazards states, Washington is a Mandate without Hazards state, and Georgia and Texas are no Mandate states.

** The reference category for the three-level planner variable is involvement of no planners.

The results of the model point to multiple findings. First, only three of the independent variables are statistically significant at a p<0.05 level. The two state planning mandate variables are
highly statistically significant and their coefficients (1.074 and 0.684) indicate strong positive relationships with incorporation of land use approaches in the fact base compared to states without planning mandates. Controlling for the other variables in the model, jurisdictions in mandate states that require a hazards element will have an index score 1.1 higher on average than states with no mandate and jurisdictions in mandates states without a hazards element requirement will have an index score 0.7 higher than states with no mandate. This finding is consistent with previous research on drivers of hazard related plan quality, both in terms of overall quality and the quality of the fact base in particular (Berke and French 1994, Dalton and Burby 1994, Burby and Dalton 1994, and Berke et al. 1996). At the most basic level, operating under state planning mandates may have led communities to adopt higher numbers of land use actions over time, thereby resulting in more land use approaches available to be assessed. Additionally, communities that have previously prepared one or more versions of a comprehensive plan through participatory processes may have higher levels of general awareness of land use planning, including among emergency managers. Higher levels of awareness of land use planning may make it more likely that land use approaches will be assessed.

The higher coefficient for the state comprehensive planning mandate requiring a hazard element than mandates without a hazard element indicates that developing a hazard element of a comprehensive plan is related to greater attention to land use approaches in a mitigation plan’s fact base. Past integration of hazards into comprehensive planning may have resulted in a community targeting more land use approaches to address hazards. Also, it is possible that the requirement to have a hazard element led local planners to reach out to emergency managers in past comprehensive planning processes. Involvement in past comprehensive planning efforts may have increased emergency managers’ awareness of existing land use approaches that they then in turn incorporate into the hazard mitigation plan.

The number of presidentially declared disasters in the ten years prior to plan adoption is also related to the incorporation of land use approaches, but in the opposite direction from what was expected. Experiencing more presidentially declared disasters had a negative influence on the
assessment of land use approaches. The effect size is not particularly large though, (each additional presidentially declared disaster is associated with an 0.07 lower index score), controlling for the other variables in the model. Nonetheless, this finding suggests that as communities are hit repeatedly with disasters they focus less attention in their mitigation plan on reviewing land use approaches available to reduce long-term risk. One potentially important difference in this study from earlier studies that have mostly found a positive influence of hazard experience on plan quality is that the plans in this study are hazard mitigation plans as opposed to comprehensive plans (Brody 2003 and Burby 2003). In the context of comprehensive planning, greater hazard experience may elevate hazard awareness and saliency, thereby leading to greater inclusion of hazards in comprehensive plans that might otherwise fail to address hazards. Hazard mitigation plans, on the other hand, are implicitly focused on hazards, but are not necessarily focused on land use and development management. A critique of the Disaster Mitigation Act (Smith, Lyles and Berke Forthcoming) is that the federal planning framework promotes short-term project-oriented grants administration over long-term planning for regulatory and programmatic changes. Thus, the results here may indicate that additional hazard experience increases a community’s focus on securing federal grant funds instead of considering existing land use planning approaches.

Finally, while the influence of jurisdiction planners and other jurisdiction planners are both positive, neither is statistically significant at any commonly accepted levels such as p<0.05 or p<0.1. Thus, one aspect of the central hypothesis, namely that involvement of local planners in the stakeholder network positively influence the assessment of land use approaches, is not strongly supported.9

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9 As noted in footnotes 6 and 8, alternative model specifications – median regression and ordinary least squares regression with robust standard errors – indicated marginal confidence in the positive influence of jurisdiction specific planners. While the confidence in these findings is not strong and the hypothesis of a positive influence of planners is not strongly supported, the findings do suggest that jurisdiction specific planners have a positive influence on assessments of land use approaches to mitigation.
5.3. Predicting the Proposal of Land Use Policies in Mitigation Strategies

Table 5.3 includes the results of the Poisson regression model explaining the proposal of land use policies (and actions) in the mitigation strategies of hazard mitigation plans as a function of state policy context, local community context, and stakeholder network diversity in the planning process variables. The null deviance in the model was reduced from 314.16 to 209.72 using nine degrees of freedom; the Akaike Information Criterion is 468.53. To test for overdispersion, the model was also run as using a quasi-Poisson link function. The dispersion parameter was found to be 1.27, which reduces concerns about overdispersion since that value is sufficiently close to one to support the assumption in a Poisson model of a dispersion parameter of 1.00. Multicollinearity was not found to be a concern.

As a test of the findings over different model specifications, the model was run as a median regression also. The sign and magnitude of the variables determined to be statistically significant at the p<0.05 level in the Poisson model were the same, confirming the core findings of the Poisson model. In the median regression model, the state mandate requiring comprehensive plans with a hazards element variable was positive and statistically significant at the p=0.018 (median regression) level. It is interesting to note in this model that state mandates requiring a hazard element are associated with the proposal of more land use actions but mandates without hazard elements are not. The implication here is that encouraging greater incorporation of hazards into comprehensive land use planning appears to pay dividends above and beyond simply having a planning mandate in generating greater incorporation of land use approaches into hazards planning.

None of the variance inflation factors were higher than 1.2.
Table 5.3: Explaining Proposal of Land Use Policies

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>z-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>**State Planning Policy Context * **</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mandate with Hazards</td>
<td>0.252</td>
<td>0.186</td>
<td>1.352</td>
<td>0.176</td>
</tr>
<tr>
<td>Mandate w/o Hazards</td>
<td>-1.677</td>
<td>0.295</td>
<td>-0.569</td>
<td>0.570</td>
</tr>
<tr>
<td><strong>Local Community Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Population Density (logged)</td>
<td>-0.120</td>
<td>0.046</td>
<td>-2.605</td>
<td>0.009 **</td>
</tr>
<tr>
<td>Number of Presidentially Declared Disasters in 10 years Prior to Plan Adoption</td>
<td>-0.188</td>
<td>0.043</td>
<td>-4.386</td>
<td>0.000 ***</td>
</tr>
<tr>
<td>Population Growth in 10 years Prior to Plan Adoption</td>
<td>0.001</td>
<td>0.003</td>
<td>0.440</td>
<td>0.660</td>
</tr>
<tr>
<td>Median House Value</td>
<td>-3.9e-8</td>
<td>5.7e-7</td>
<td>-0.069</td>
<td>0.945</td>
</tr>
<tr>
<td>**Stakeholder Network Diversity in the Planning Process **</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jurisdiction’s Own Planner</td>
<td>0.866</td>
<td>0.197</td>
<td>4.401</td>
<td>0.000 ***</td>
</tr>
<tr>
<td>Other Jurisdiction’s Planner</td>
<td>0.092</td>
<td>0.236</td>
<td>0.392</td>
<td>0.695</td>
</tr>
<tr>
<td>Steering Committee Groups</td>
<td>-0.039</td>
<td>0.021</td>
<td>1.853</td>
<td>0.064</td>
</tr>
<tr>
<td>Intercept</td>
<td>1.035</td>
<td>0.309</td>
<td>3.344</td>
<td>0.001 ***</td>
</tr>
</tbody>
</table>

Significance codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1
Null Deviance: 314.16 on 174 degrees of freedom
Residual Deviance: 209.72 on 165 degrees of freedom
AIC: 468.53
n = 175
* The reference category for the three-level state mandate variable is no state mandate for local comprehensive planning. California, Florida and North Carolina are Mandate with Hazards states, Washington is a Mandate without Hazards state, and Georgia and Texas are no Mandate states.
** The reference category for the three-level planner variable is involvement of no planners.

The results of this model also provide multiple findings. Four variables are statistically significant at the p<0.1 level, including two stakeholder network diversity in the planning process.
variables and two local community characteristics variables. The first finding is that the jurisdiction’s own planner variable is highly statistically significant and its coefficient (0.866) indicates a strong positive influence on the proposal of land use policies. Controlling for other variables in the model, jurisdictions with their own planner involved are more than twice as likely to propose an additional land use policy in their plan, controlling for other variables in the model.\textsuperscript{12} This finding provides strong support for the central hypothesis that local planner involvement in hazard mitigation planning processes leads to incorporation of more land use approaches in mitigation planning outputs.

Notably, the other jurisdiction’s planner variable is insignificant at commonly accepted levels, which suggests that simply having a local planner from one of the jurisdictions involved in a hazard mitigation planning process is not adequate for prompting a jurisdiction to propose land use policies. This distinction suggests that it is not just land use-oriented knowledge or skills that planners bring to hazard mitigation planning, but that there is also an important jurisdiction-specific contextual aspect to their importance, such as knowledge of what types of land use actions are politically feasible or technically possible.

The number of groups involved on the steering committee is marginally statistically significant (p=0.064) and its negative coefficient indicates a negative relationship between a greater diversity of steering committee groups involved and proposal of land use policies. The coefficient size, however, points to a weak relationship, with each additional group involved decreasing the likelihood of proposal of an additional land use policy by 3.9\%, controlling for other variables in the model. This finding, though somewhat weak in terms of effect size and confidence in the inference, contrasts with the finding of a positive effect of groups involved (Burby\textsuperscript{2003}).\textsuperscript{13} Perhaps involving more different types of groups leads to competition whereby groups advocate for actions related to their particularly disciplinary affiliation (e.g. public works, public health, transportation, etc.), thereby

\textsuperscript{12} Jurisdictions with a jurisdiction specific planner are 138\%, or 2.38 times, more likely to propose an additional land use action.

\textsuperscript{13} Burby (2003) assessed comprehensive plans, not hazard mitigation plans, and the influence of group involvement may vary from one planning domain to another.
reducing the attention that can be given to land use approaches. Alternatively, participation of more groups in comprehensive planning processes, as studied by Burby, may have a different influence than in stand-alone hazard mitigation planning processes.

The number of presidentially declared disasters in the ten years prior to the plan is also highly statistically significant (p<0.001), and as it was in the fact base model, the coefficient is negative. For each additional major disaster declaration, a community is 17.2% less likely to propose an additional land use policy, controlling for other variables in the model. As in the fact base model results, more major disasters appear to lead to less incorporation of land use approaches. This finding fits with Burby and Dalton (1994) who found that after repeated losses communities included fewer development management approaches in comprehensive plans. A plausible explanation is that jurisdictions focus on project-oriented federal grant funding in the wake of disasters because many communities and states use the list of policies and actions proposed in the plans to prioritize grant applications to FEMA. Thus, there is a large incentive for communities to focus their proposed actions on ‘shovel-ready’ projects instead of regulatory changes, such as land use policies. The statistically significant and negative relationship of population density is consistent with previous plan quality studies. The interpretation here is that as jurisdictions become more dense, there is often less land available in non-hazardous locations, which can drive up demand for development in hazardous areas and reduce willingness to employ land use controls in those areas (Burby and Dalton 1994, Dalton and Burby 1994 and Brody et al. 2006).

Surprisingly, state planning mandates are not statistically significantly predictors of the proposal of land use actions. This finding does not directly contradict previous studies because this model focuses on just land use approaches, not overall plan quality. But, when coupled with the finding of a strong relationship between state planning mandates and assessment of land use approaches in the fact base, it does indicate that the influence of planning mandates is not uniform across plan quality principles. The finding raises the question of why mandates are not related to higher levels of proposed land use policies? Perhaps it is due to the fact that planning mandates
regulate comprehensive planning, not hazard mitigation planning. Thus, the theorized influences of mandates on decisions about future policy may be diluted outside the comprehensive planning context.\textsuperscript{14} The implication here would be that the federal government, or their state partners, could potentially influence the proposal of land use policies in hazard mitigation plan by placing more emphasis on them in planning requirements.

5.4. Predicting the Inclusion of Implementation Information for Land Use Policies Proposed in Mitigation Strategies

Table 5.4 includes the results of the Poisson regression model explaining the inclusion of implementation information for the land use policies proposed in the mitigation strategies of hazard mitigation plans as a function of state policy context, local community context, and stakeholder network diversity in the planning process variables. An additional independent variable is included; namely, the number of land use policies proposed in the plan is included to control for the number of opportunities to provide implementation information in the plan. The null deviance in the model was reduced from 526.80 to 242.33 using ten degrees of freedom; the Akaike Information Criterion is 503.37.\textsuperscript{15} To test for overdispersion, the model was also run using a quasi-Poisson link function. The dispersion parameter was found to be 1.42, which reduces concerns about overdispersion since that value is sufficiently close to one to support the assumption in a Poisson model of a dispersion parameter of 1.00. Multicollinearity was not found to be a concern.\textsuperscript{16}

\textsuperscript{14} As a test of possible interactions between the state planning policy context and the involvement of planners, a model with an interaction term for the Planner variable and the Mandate variable was run. None of the interaction terms were statistically significant (p<0.1) and the pattern of statistical significance in the main model presented was the same.

\textsuperscript{15} As a test of the findings over different model specifications, the model was run as a median regression also. The results of the model were clouded by problems encountered with the algorithm in estimating the residual sum of squares. Multiple algorithms were tried but none returned clear results. However, not surprisingly the count of proposed actions appeared to be the driving factor in the model with strong positive coefficient values and strong confidence in the coefficient estimates for that variable. Bivariate regression with the number of proposed actions as the predictor of the implementation count results in a positive coefficient at a p=0.00 and an R-squared for the model 0.6669, which further supports the conclusion that the number of proposed actions is a key driver of implementation information.

\textsuperscript{16} None of the variance inflation factors were higher than 1.25.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>z-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Proposed Policies</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land Use Policies</td>
<td>0.336</td>
<td>0.032</td>
<td>10.401</td>
<td>0.000 ***</td>
</tr>
<tr>
<td>**State Planning Policy Context * **</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mandate with Hazards</td>
<td>0.522</td>
<td>0.185</td>
<td>2.827</td>
<td>0.005 **</td>
</tr>
<tr>
<td>Mandate w/o Hazards</td>
<td>0.606</td>
<td>0.259</td>
<td>2.339</td>
<td>0.019 *</td>
</tr>
<tr>
<td><strong>Local Community Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Population Density (logged)</td>
<td>0.005</td>
<td>0.043</td>
<td>0.105</td>
<td>0.917</td>
</tr>
<tr>
<td>Number of Presidentially Declared Disasters</td>
<td>-0.129</td>
<td>0.038</td>
<td>-3.372</td>
<td>0.001 ***</td>
</tr>
<tr>
<td>Declared Disasters in 10 years Prior to Plan Adoption</td>
<td>-0.017</td>
<td>0.004</td>
<td>-3.914</td>
<td>0.000 ***</td>
</tr>
<tr>
<td>Population Growth in 10 years Prior to Plan Adoption</td>
<td>-8.4e-7</td>
<td>5.5e-7</td>
<td>-1.510</td>
<td>0.131</td>
</tr>
<tr>
<td>**Stakeholder Network Diversity in the Planning Process **</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jurisdiction’s Own Planner</td>
<td>0.512</td>
<td>0.193</td>
<td>2.655</td>
<td>0.007 **</td>
</tr>
<tr>
<td>Other Jurisdiction’s Planner</td>
<td>0.290</td>
<td>0.212</td>
<td>1.367</td>
<td>0.172</td>
</tr>
<tr>
<td>Steering Committee Groups</td>
<td>-0.043</td>
<td>0.019</td>
<td>-2.253</td>
<td>0.024 *</td>
</tr>
<tr>
<td>Intercept</td>
<td>0.111</td>
<td>0.301</td>
<td>0.367</td>
<td>0.714</td>
</tr>
</tbody>
</table>

Significance codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1
Null Deviance: 526.80 on 174 degrees of freedom
Residual Deviance: 242.33 on 164 degrees of freedom
AIC: 503.37
n = 175

* The reference category for the three-level state mandate variable is no state mandate for local comprehensive planning. California, Florida and North Carolina are Mandate with Hazards states, Washington is a Mandate without Hazards state, and Georgia and Texas are no Mandate states.

** The reference category for the three-level planner variable is involvement of no planners.

The findings of this model show that inclusion of implementation information appears to be driven by the widest array of factors of any of the dependent variables assessed. A key variable in the
model is inclusion of land use policies, which is the dependent variable in the overall land use policies model in Table 5.3. It is included here because it is a highly defensible assumption that a plan will not include implementation information for land use policies if land use policies are not included in the plan. By extension, it stands to reason that plans with more land use policies have more land use implementation information since there are more opportunities to provide such information. State planning mandates with and without hazard elements are statistically significantly and positively related to inclusion of more implementation information. Likewise, inclusion of a jurisdiction’s own planner is positively and statistically significantly related to inclusion of more implementation information. Meanwhile, inclusion of more groups and a greater number of disasters are related to inclusion of less implementation information. The direction of the relationships for each of these variables fits with the general patterns observed in the previous two models. The most notable diversion from the previous patterns of direction of influence is for population growth, which is negative and statistically significant in this model but was not statistically significant at the p<0.1 level in any of the other models.

Of the three models included in this chapter, the findings from this model fit most closely with the conceptual model laid out in Chapter 3 and relationships hypothesized in Table 5.1. Two variables from each of the three conceptual dimensions (state planning policy context, local community characteristics, and stakeholder network diversity in the planning process) are statistically significant and generally fit with the expected direction of influence. Moreover, both of the mandate variables and the jurisdiction’s own planner variable have positive relationships, while overall steering committee group diverse is negatively related. The implication of this finding is that there are multiple policy levers that may be manipulated with the expectation of an increase in land use implementation information. While the negative influence of the number of disasters may be due to increased attention to project-based approaches to mitigation in the wake of declared disasters, the unexpected negative relationship of population growth is more difficult to explain. The population growth coefficient influence of a 1.7% decrease in the likelihood of an additional piece of
implementation information for each percent increase in population growth is small, but it may reflect inattention to or resistance of fast growing communities to including implementation information in mitigation plans.

5.5 Discussion and Conclusions

The primary conclusion to be drawn from the results presented in this chapter is that the central hypothesis that involvement of local planners in hazard mitigation planning processes will lead to greater incorporation of land use approaches in hazard mitigation plans is largely corroborated. Other expected relationships in the conceptual framework laid out earlier, particularly positive influences of state planning policy mandates, are largely corroborated as well. There are important nuances to both of these conclusions because, as is shown in Table 5.5, the relationships observed between the independent variables and the different principles of plan quality are not identical across all three models. Additionally, one key local community characteristic variable, experience with previous hazard events, is consistently related to land use-related plan quality but in the opposite direction as expected. The theoretical and practical implications of these primary findings are discussed below.
Table 5.5: Summary of Relationships Between Independent Variables and Land Use-Related Plan Quality (Only Statistically Significant Relationships at p<0.1 level Shown)

<table>
<thead>
<tr>
<th></th>
<th>Fact Base</th>
<th>Policies</th>
<th>Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>State Policy Context</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mandate with Hazards</td>
<td>Positive</td>
<td>--</td>
<td>Positive</td>
</tr>
<tr>
<td>Mandate w/o Hazards</td>
<td>Positive</td>
<td>--</td>
<td>Positive</td>
</tr>
<tr>
<td><strong>Local Community Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Population Density (logged)</td>
<td>--</td>
<td>Negative</td>
<td>--</td>
</tr>
<tr>
<td>Number of Presidentally Declared Disasters in 10 years Prior to Plan Adoption</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>Population Growth in 10 years Prior to Plan Adoption</td>
<td>--</td>
<td>--</td>
<td>Negative</td>
</tr>
<tr>
<td>Median House Value</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td><strong>Stakeholder Network Diversity in the Planning Process</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jurisdiction’s Own Planner</td>
<td>--</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>Other Jurisdiction’s Planner</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Steering Committee Groups</td>
<td>--</td>
<td>Negative</td>
<td>Negative</td>
</tr>
</tbody>
</table>

'Positive' denotes positive coefficient
'Negative' denotes negative coefficient
'—' denotes no statistically significant association at p<0.1 level

Local planners, more specifically jurisdictions’ own planners, have a positive influence on the proposal of land use policies and inclusion of implementation information, while planners from other jurisdictions have no detectable influence. Neither jurisdictions’ own planners or other jurisdiction’s planners are influential on the assessment of land use approaches in the fact base. The primary theoretical implication of these findings is that planners do indeed appear to matter when it comes to increasing plan quality, although their influence may vary depending on the plan quality.
principle of interest. While this interpretation may seem self evident, past studies have not assessed this relationship. The positive relationship of local planners to land use policies and implementation information, but not assessment of land use approaches in the fact base suggests that while any number of mitigation stakeholders can compile information about existing land use approaches, planners bring unique assets needed to include land use approaches as part of a future-oriented mitigation strategy.

Second, the distinction between the positive relationships for a jurisdiction’s own planner and no detectable relationships for other jurisdiction’s planners suggests that jurisdiction’s own planners bring distinct assets to planning processes in that planners from other jurisdictions do not. While these analyses cannot pinpoint the specific assets jurisdictions’ own planners bring, plausible possibilities include locally specific knowledge (e.g. land use patterns, site-specific hazards, and details of existing regulations), and local regulatory responsibility (e.g. site and plan review), and connections to other local decision makers (e.g. elected officials and planning commissioners). Any of these types of assets may provide the jurisdiction’s own planner with increased confidence and credibility for suggesting the inclusion of potentially controversial or technically complex land use policies in the hazard mitigation plan. A potential complementary explanation is that in some cases the jurisdiction’s own planner variable used here distinguishes between communities with higher planning capacities in general (i.e. communities that have a local planner to handle development management issues) and communities with lower planning capacities in general (i.e. communities in which zoning, subdivision regulations and other development management issues are handled by building code officials, clerks or other non-planner officials).

Given that just 35% of jurisdictions in the sample had their own planner involved in the stakeholder network in the planning process (see table 4.5), there is an important practical implication of this finding as well. Specifically, it may not occur to emergency managers to reach out to local planners for involvement in hazard mitigation planning because the typical partners for the core emergency management responsibilities of preparedness and response are more likely to be public
safety, public works, utility, public health officials, and others primarily focused on maintaining
safety during an event and restoring core functions after an event. Conversely, local planners may not
push to be involved in hazard mitigation planning because they may conceive hazard mitigation to be
a short-term emergency management function more in line with preparedness and response. Federal
and state mitigation officials may be able to more strongly encourage emergency managers
responsible for hazard mitigation planning to involve more local planners from more jurisdictions in
the planning process. Through partnerships with national and state planning associations they could
directly reach out to local planners to encourage increased involvement on their part as well. Such a
shift in emphasis could be an important step in moving communities closer to a ‘sustainable hazard
mitigation planning program’ (Godschalk et al 1999) that increases local resilience through
development management approaches.

The uneven relationships between state planning mandates and land use-related plan quality
in these models is another key finding. The positive influence on the assessment of existing land use
approaches in the fact base fits with prior studies and makes intuitive sense because communities in
states with stronger planning traditions are likely to have more land use approaches to assess.
Additionally, jurisdictions in states with planning mandates are more likely to have a wider range of
people that have encountered land use planning in their work or daily lives, which means that there
are likely to be more people (e.g. emergency managers and contracting consultants) with enough
familiarity with local land use approaches to assess them in the hazard mitigation plan. The lack of
positive influence of state planning mandates on proposed land use policies is unexpected but
important. This finding suggests that state planning mandates are not effective policy tools for
motivating local jurisdictions to include land policies in mitigation plans, which appears to be driven
more by the involvement of jurisdiction specific planners. The positive influence of state mandates
and local planners with inclusion of implementation information for land use action is important
because inclusion of implementation information is a demonstration of a community’s commitment to
work to adopt and use a policy or action it proposes.
The consistently negative influence of disaster experience on land use-related plan quality in these models is counter to some previous studies but aligns with Burby and Dalton (1994). Burby and Dalton conclude that repeated losses lead to more support for policies focused on existing development (e.g. building codes) than land use policies focused on future development (1994). A theoretical implication of the negative influence of disaster experience is that ‘windows of opportunity’ (Birkland 1997, 2006) may open differently depending on the policy context for addressing hazards. Major disasters may make land use planners responsible for comprehensive planning more aware of the need to integrate hazards into comprehensive plans (see for example Burby 2003). In the context of hazard mitigation plans, more disasters apparently leads to less integration of land use approaches across all three principles of plan quality. The underlying driver of this finding may be that emergency managers and other mitigation stakeholders in jurisdictions that have repeated major disasters focus their attention on securing project-oriented, post-disaster federal grant funding. This dynamic may preclude stepping back and using the hazard mitigation plan to address long-term risk reduction through land use approaches. Practically speaking, these findings suggest that federal and state mitigation officials may want to assess the degree to which existing mitigation planning and grant review requirements, guidance, and support for local officials result in disincentives for jurisdictions to pursue mitigation strategies incorporating a balance of approaches, including preventative land use.

In summary, it appears that state planning mandates are the strongest driver helping generate more assessment of land use approaches in the fact bases of mitigation plans, while inclusion of local planners in mitigation planning appear to be the strongest driver in motivating a jurisdiction to propose land use policies. When it comes to including more implementation information, both state planning mandates and local planners appear to play strong roles, which may indicate a need for even stronger coordination of state and local efforts to integrate land use planning and emergency management. Interestingly, the local community factors of population density and more experience with major disasters appear to reduce inclusion of land use approaches. Overcoming these challenges
may mean that local officials need even more federal and state support in pursuing land use approaches to mitigation because these factors are largely outside the control of local officials.

As with any study there are limitations to these analyses and care has been taken to call attention to such limitations throughout this dissertation. Three main limitations are detailed here. First, the three-level measure of planner involvement (no planner, other jurisdiction’s planner and jurisdiction’s own planner) is an admittedly coarse measure of planner involvement. Unfortunately, detail in mitigation plans about the involvement of stakeholders in development of the plans is highly variable and, on the whole, very thin. More information about if and how planners actually participated in the planning process would increase our understanding of how planners influence the incorporation of land use into hazard mitigation plans. Similarly, more information about the training, experience, and skills brought by planners would provide important insights into what it is about planners that makes them valuable participants in hazard mitigation planning processes. Research along the lines of Burby, May and colleagues (1997) on the influence of planner commitment and the work of Stevens on the influence of the role identities planners assume (2010) hold promise as well. Second, in the absence of more nuanced quantitative measures of state planning policy context, the three-level measure of state planning mandates is also coarse. Further quantitative measures of the requirements of state planning mandates and about how the mandates are interpreted, enforced and conformed with would increase understanding of the relationship between state and local planning efforts and the relationship between land use planning and hazard mitigation planning at the state level.

Third, the lack of network structure measures in these models limits the ability to test all the hypotheses generated from the conceptual model. Generating network structure measures from observational (e.g. cooperation on submission of grant applications or email exchanges) or respondent data (e.g. surveys or interviews) is resource intensive. Doing so for all 175 jurisdictions in these models was beyond the capacities of this research project. Researchers should consider ways to leverage existing data sets and data mining tools to measure network structures. Although most of the
planning processes studied in this dissertation predate the recent boom in use of social networking tools (e.g. Facebook, Twitter, etc.), in the future such databases may provide opportunities for measuring communication, information flows, and other network-oriented data about mitigation planning. A more traditional, but potentially useful, approach to increasing baseline network data would be for federal and state officials to encourage local governments to more consistently track participation in mitigation planning processes in ways that could be used to measure networks (e.g. by including meeting attendance logs, detailed meeting minutes and other forms of planning process documentation in plan appendices). With these limitations in mind, the next part of the dissertation digs deeper into the role of planners involved in hazard mitigation planning processes, the broader network of stakeholders those planners work within, the varying state legal and regulatory contexts in which plans are developed and implemented, and the local community characteristics local officials encounter.
Chapter 6

Explaining the Influence of Planner Involvement

This chapter compares four case studies of local hazard mitigation planning to answer the second research question posed in Chapter 1: when local planners are included in hazard mitigation stakeholder networks, do differences in how they are involved in the network of the hazard mitigation stakeholders contribute to greater incorporation of land use approaches in mitigation efforts? The comparisons focus on application of three social network analysis concepts: 1) the centrality of local planners in networks, 2) the strength of connections between local planners and emergency managers, and 3) the overall structure of the network. Individual case study write-ups in Appendices II through V supplement this chapter. Before analyzing the cases, this chapter first compares the state-level context for local mitigation planning in Florida and North Carolina, in which the four case counties are located.

6.1 State Planning Policy Contexts for Florida and North Carolina

Florida and North Carolina share many features relevant to mitigation planning, but they differ in important ways also. As southeastern states, they share hazards of greatest concern, namely coastal storms (e.g. hurricanes) and floods. Each state has experienced multiple Presidentially Declared Disasters over the last two decades, though Florida has been declared 40 times to North Carolina’s 19 times (PERI http://www.peripresdecusa.org/mainframe.htm accessed 2-16-2012). Massive losses from Hurricane Andrew (1992) in Florida and Hurricanes Fran (1996) and Floyd (1999) in North Carolina led to increased attention to hazard mitigation in the states. Between 2000 and 2009, Florida experienced nine Presidentially Declared hurricanes, including Charley, Frances, Ivan and Jeanne in 2004, compared to three in North Carolina, none of which have been nearly as
devastating as Fran or Floyd. While major disasters have created windows of opportunity for increased attention to mitigation in both states (Birkland 1997, 2006), Florida experienced more major disasters on average and North Carolina has experienced a relative reprieve since 2000.1

6.1.a. State Coordination of Local Land Use Planning

Florida and North Carolina each have long histories of state requirements for local land use planning in coastal areas, including requirements for attention to natural hazards. Florida initiated state growth management in the 1970s and in 1985 overhauled its regulations for local planning into the State Comprehensive Planning Act (Burby and May 1997). Up until 2011, local governments were required to adopt comprehensive plans consistent with state goals. Plans were required to include a coastal management element that addresses natural hazards. Plan content was subject to minimum standards reviewed by the state. Additionally, local land use regulations and capital investments had to be consistent with the local comprehensive plan.

Although they took place after the period on which this dissertation focuses, recent major changes to the state planning policy context in Florida merit brief attention. On June 2, 2011, Florida’s governor signed into law a bill that, as one of the state’s leading planning advocacy groups writes: “virtually eliminates any meaningful state checks and balances over local government decisions, decimates citizens' ability to effectively challenge decisions, and opens Florida's rural lands for sprawling development” (1000 Friends of Florida 2011).2 Due to the fact that most Florida hazard mitigation plans (i.e. Local Mitigation Strategies) were updated in 2009 and 2010, the impacts of the

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1 Since the planning processes studies in this dissertation took place in 2009 and 2010, this claim does not include the 2011 hurricane season, which included Hurricane Irene.

2 House Bill 7207 redesignates the “Local Government Comprehensive Planning & Land Development Regulation Act” as the “Community Planning Act” (CPA) (State of Florida 2011). Analysis by 1000 Friends of Florida and the Florida Chapter of the American Planning Association highlight specific provisions of the new law that weaken requirements and limit state oversight of local planning (1000 Friends of Florida 2011 and Florida Chapter of American Planning Association undated). These include: 1) repealing rule 9J-5, which required plan and plan amendment consistency with, among other things, the State Comprehensive plan, although some provision of 9J-5 have been incorporated elsewhere in the CPA and 2) eliminating state mandates for some forms of concurrency (e.g. transportation, schools and parks/recreation) that ensure adequate public facilities to support development. A related bill, Senate Bill 2156, eliminates the Department of Community Affairs and creates in its place a Division of Community Development in the Department of Economic Opportunity, thereby lowering the administrative status of growth management in the state.
2011 law on mitigation plans will likely remain unclear until 2014 or 2015 when the next phase of DMA-required updates take place. Nonetheless, weakening linkages between state goals and local comprehensive planning and between local development decisions and the provision of adequate public facilities seem unlikely to have a positive effect on mitigation planning.

In North Carolina the Coastal Area Management Act (CAMA) has required 20 coastal counties and the municipalities therein to maintain local land use plans since 1974. The plans are reviewed for consistency with state guidelines (Burby and May 1997). Attention must be paid to hazard mitigation, emergency evacuation and post-disaster recovery in the land use plans. However, requirements for internal consistency between local plans and local regulations are weak and the state cannot force adoption of any specific land use policy. In summary, although both states have been recognized as strong coastal planning states, until recently Florida took a more coercive approach to promoting local land use planning than North Carolina.

6.1.b. State Coordination of Local Mitigation

The Disaster Mitigation Act is a reflexive law that devolves considerable authority to states to coordinate local mitigation planning (Nolan 2009). As part of the larger Department of Homeland Security-funded project from which this dissertation extends a comparative analysis of Florida and North Carolina’s approaches to coordinating local mitigation planning was conducted (Berke, Smith and Lyles http://www.ie.unc.edu/cscd/publications.cfm). The analysis included reviews of both state’s hazard mitigation plans, and mail surveys and interviews of current and former state officials in charge of mitigation efforts.

Florida created its Local Mitigation Strategy (LMS) requirements in advance of the federal Disaster Mitigation Act of 2000. State agencies have authority to specify how state and federal mitigation policies are carried out by local governments (Berke, Smith and Lyles, http://www.ie.unc.edu/cscd/publications.cfm). The state hazard mitigation plan describes the role of LMSs as a bridge to link other local planning initiatives to mitigation efforts, including land development regulations, and includes a section on state efforts to improve local integration of hazard
mitigation planning into local comprehensive plans (Florida Department of Community Affairs 2007, p 1-6). The state plan also indicates that LMSs serve as tools to prioritize and rank projects for all the participating organizations within a county using cost-benefit analysis approaches (Florida Department of Community Affairs 2007, p 20-21). The ranking process is intended to facilitate greater success and efficiency in obtaining federal post-disaster mitigation funds by having local governments design, vet and prioritize projects before a disaster occurs (Berke, Lyles and Smith http://www.ie.unc.edu/cscd/publications.cfm). Thus, while there is state recognition of the importance of better coordination of mitigation and land use efforts for risk reduction, there is also a strong push for local governments to use LMSs to prioritize ‘shovel-ready’ projects eligible for future federal funding.

In practice, the project-oriented aspect of Florida’s approach appears to take precedence in Local Mitigation Strategies. Out of the 30 Florida jurisdictions included in the sample for regression analysis of plan quality data in Chapter 5, just six (20%) proposed land use approaches for future action. Only one of those included more than one land use approach (Lafayette County.) An F-test comparing the number of land use approaches across the six states indicates less inclusion of land use approaches in Florida plans than in the plans from the other two states with strong land use planning traditions, California and North Carolina (F-test p-value <0.001) and is lower than jurisdictions in Georgia, which is one of the two weak planning states included in the study.3 Limited inclusion of land use approaches in a state that has been recognized widely as a national leader in growth management is surprising. These qualitative and quantitative findings provide evidence that Florida’s approach to coordination mitigation planning is not resulting in, and instead may be suppressing, widespread inclusion of future-oriented land use approaches in LMSs.

In comparison, North Carolina did not develop a program like Florida’s Local Mitigation Strategy prior to the Disaster Mitigation Act. But it did require adoption of a hazard mitigation plan

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3 Florida jurisdictions’ inclusion of land use approaches is statistically indistinguishable from jurisdictions in Texas and Washington
to be eligible for mitigation grants before passage of the DMA (Smith, Lyles and Berke Forthcoming). North Carolina has entrusted local officials with latitude to shape their plans’ balance of projects (e.g. discrete structural or property protection actions), programs (e.g. wide-reaching education and outreach initiatives) and regulations (e.g. policy-oriented land use approaches) (Berke, Lyles and Smith http://www.ie.unc.edu/cscd/publications.cfm). Further, guidelines for how to use land use approaches in risk reduction efforts were developed and distributed to local officials (Smith, Lyles and Berke Forthcoming). A training program was used to show how land use measures could be used to mitigate hazards while also achieving other community goals and objectives. And, whereas few Florida jurisdictions included land use approaches in their mitigation plans, 97% of North Carolina jurisdictions (29 of 30 in the sample) did so. Twenty-five of them included two or more land use approaches and one jurisdiction, Brunswick County, included ten different land use approaches. Thus, the evidence suggests that North Carolina’s active encouragement of inclusion of land use approaches as part of a flexible and comprehensive mitigation strategy is producing its intended effects.

Meanwhile, both Florida and North Carolina have provided substantial mitigation support to local governments (Smith, Lyles and Berke Forthcoming). Florida has dedicated mitigation funding streams, including programs to retrofit public shelters and residences. North Carolina uses state funding to help cover the local match for Hazard Mitigation Grant Program grants, acquire and relocate at-risk properties, and update local Flood Insurance Rate Maps. Both states provide multiple types of technical assistance, including manuals and guidebooks, workshops and conferences for local officials, data for use in local plans and direct assistance during local planning processes. Florida’s staffing levels for assisting local mitigation officials has ranged between 40 and 50 state employees over the past decade (about 1 staff person per 4.6 local governments) and was 48 in 2010 (Berke, Lyles and Smith http://www.ie.unc.edu/cscd/publications.cfm and Smith, Lyles and Berke Forthcoming). In the early 2000s, North Carolina had similar staffing levels, although by 2010 staffing had dropped to 12 persons (about 1 staff person per 30.1 local governments). This decline is
one indicator of how the federal mitigation framework is driven by post-disaster funding available to state and local governments, rather than pre-disaster efforts.

The differences between the approaches taken by Florida and North Carolina raise questions about whether these state-level differences may impact who is involved in local mitigation planning and implementation. Does North Carolina’s more flexible approach and emphasis on comprehensive strategies lead emergency managers there to try and involve local planners in mitigation efforts more than their peers in Florida? Also, does Florida’s emphasis on prioritizing discrete projects for federal post-disaster funding result in a lack of interest in mitigation planning among local planners?

6.2. Comparative Analysis of Four Case Studies

6.2.a. Planning Outputs

The four cases vary widely in land use-related mitigation plan quality and ongoing implementation. Overall integration of land use approaches to mitigation is strongest in the New Hanover County mitigation plan, especially the innovative policies included in the future-oriented sections of its plan. Onslow County’s plan contains land use approaches throughout, but the plan is fragmented and focuses on continued enforcement of permissive development regulations. Martin County’s plan provides considerable detail on existing land use policies, while paying limited attention to land use in its future-oriented sections. Brevard County’s plan has the weakest integration of land use and is the least well-organized and written plan.

The highly readable and well-organized New Hanover County plan incorporates land use approaches throughout and is especially strong in its proposed policies and actions. Clearly and specifically worded innovative land use policies include targeted moratoria on development proposals, specific density ceilings in hazardous areas, and density tradeoffs (Table 6.1). Actions are accompanied by specific information about the responsible agency, relevant hazards, potential funding sources, and priority status, although timeframes and estimated costs are only listed as TBD

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4 The findings presented here are drawn from the four individual case studies. For more information on a particular case, please consult the associated Appendix: II for Brevard County, III for Martin County, IV for Onslow County, and V for New Hanover County.
(i.e. To Be Determined). This partial information on implementation leaves important gaps, but is as
good as or better than the implementation information included in most plans assessed as part of the
six-state content analysis.

Onslow County’s plan also incorporates land use approaches throughout, but the plan is less
well organized and its descriptions of land use plans and policies are often confusing. Future-oriented
land use proposals consist of continuation of what interviewees indicated was a development
management program that lacked stringent controls of development in floodplains and other
hazardous areas (Table 6.1). Additionally, information about how the land use approaches will be
implemented is limited to a responsible agency and an ‘ongoing’ timeframe. The lack of specific
implementation information may result from the land use-related proposals not involving
strengthening existing regulations or adopting new policies.

In Florida, Martin County’s plan is quite readable and well organized. Of the four plans,
Martin County’s most effectively assesses existing land use capabilities by complementing clear
narrative summaries in the main body with appendices including comprehensive lists of relevant
policies and objectives. Existing land use capabilities include a long-standing growth management
program that limits development in hazardous areas and promotes environmental conservation.
Meanwhile, future-oriented land use approaches to mitigation are limited to a review of existing
county development regulations, a proposal sponsored by the county engineering department, not the
growth management department (Table 6.1). Priority status for the initiative is ‘unranked,’ but a
potential funding source is identified and the timeline is identified, albeit more than a year.

Finally, Brevard County’s hazard mitigation plan is a disjointed, 1,822-page behemoth with
very limited integration of land use approaches. Its assessment of existing capabilities consists of un-
synthesized excerpts of land use ordinance and policy language. Hundreds of projects are compiled
into what amount to long wish lists were huge amounts of federal funding to become available.
Implementation information for the projects is scattered across numerous tables, making it very
cumbersome to interpret the likelihood that any given action will be prioritized in practice. None of the county-level projects involve land use approaches (Table 6.1).

**Table 6.1: Land Use Approaches Included in Future-Oriented Mitigation Strategies**

<table>
<thead>
<tr>
<th>County</th>
<th>Land Use Approaches Included by County Agencies in Future Oriented Strategy Sections of Mitigation Plans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brevard County, FL</td>
<td>None</td>
</tr>
<tr>
<td>Martin County, FL</td>
<td>“Review of county development regulations to determine changes [that] could be made to make future buildings and infrastructure less vulnerable to the impact of disasters” (MCULMS 2010, page 6-19) with implementation responsibility assigned to county Engineering Department</td>
</tr>
<tr>
<td>New Hanover County, NC</td>
<td>“Following a storm event, take advantage of opportunities to acquire or purchase land located in storm hazard areas which are rendered unbuildable or have sustained substantial damage. The property should satisfy objectives including, but not limited to the conservation of open space and scenic areas and the provision of public water access” (NHCMJHMP 2010 page 9:20)</td>
</tr>
<tr>
<td></td>
<td>“Declare a moratorium on the acceptance of any request for rezoning in flood prone areas other than rezoning for a less intense use” (NHCMJHMP 2010, page 9:21)</td>
</tr>
<tr>
<td></td>
<td>“Declare a moratorium on the permitting of any new construction, new utility hookups, or redevelopment construction that would increase the intensity of land use existing in disaster prone areas” (NHCMJHMP 2010, page 9:21).</td>
</tr>
<tr>
<td></td>
<td>“Limit density to 2.5 units/acre or less in areas classified as conservation on the CAMA land use map (including areas in the 100 year, or 1% annual change floodplain). Develop a program for density tradeoffs to encourage development outside the floodplain” (NHCMJHMP 2010, page 9:22).</td>
</tr>
<tr>
<td></td>
<td>Implementation responsibility for all four is assigned to county Planning and Zoning.</td>
</tr>
<tr>
<td>Onslow County, NC</td>
<td>“Onslow County will rely on its existing ordinances and land use controls to regulate development within the floodplain. These documents will be periodically reviewed and updated” (OCMJHMP 20101, page 25) with implementation responsibility assigned to the Community Development Coordinator.</td>
</tr>
<tr>
<td></td>
<td>“Adopt a policy to prohibit development of critical public facilities in the 100-year floodplain where viable alternatives exist. Such a policy could be enforced through the County's floodplain and subdivision ordinances and permit issuance process.” (OCMJHMP 2010, page 26) with implementation responsibility assigned to the County Manager.</td>
</tr>
</tbody>
</table>

Ongoing land use-related implementation efforts are strongest in New Hanover County and Martin County. New Hanover County is implementing the innovative land use approaches included in
the plan. The actions are being used explicitly to address multiple community objectives in addition to mitigation, including green space preservation and sustainable development patterns. Martin County’s ongoing implementation comes about because of the county’s strict development management regulations that provide multiple mitigation benefits such as reducing density on barrier islands. Importantly, the rationale for those regulations – historically for quality of life issues such as preventing traffic and limiting density – and their ongoing enforcement takes place largely in isolation from the county’s hazard mitigation efforts.

Meanwhile, Onslow County and Brevard County struggle to implement their mitigation policies in general and for land use specifically because both counties have pro-development, anti-regulation political climates. Both counties have also dealt with limited planning capacity and instability in government positions critical to mitigation and land use planning efforts. Overall, then, in line with previous studies there is wide variation in hazard mitigation plan quality and ongoing implementation (Berke et al. 1996, Burby and May 1997, Burby 2003). These findings raise the question of whether variations in the hazard mitigation stakeholder networks contribute to these diverse planning outputs?

10.2.b. The Influence of Network Characteristics on Planning Outputs

The mitigation stakeholder networks observed in the four cases vary considerably in terms of involvement of local planners, ties between emergency managers and local planners, and overall network structure. As identified through surveys of mitigation planning committee members and interview of key stakeholders (see Chapter 4), Brevard County has the weakest network on these three network characteristics, New Hanover County’s network is the strongest, and Martin County and Onslow County’s are in the middle (Table 6.2). In line with theories from collaborative and communicative planning and social network analysis (see Chapter 2), the variations in the observed networks help explain variations in quality of the mitigation plans and their ongoing implementation described above.
First, Brevard County’s network, the largest of the four, is organized into a standing organization called Brevard Prepares. More than 30 pages of the county’s mitigation plan are dedicated to describing Brevard Prepares, its bylaws and operating procedures, much of which are designed to ensure clarity and fairness in the prioritization of projects for its numerous members. This very formal institutional structure is complemented by a very hierarchically structured information sharing network. The large network of more than 70 stakeholder organizations has a core of county, state, and federal emergency management organizations (triangles labeled A, B and C respectively in Figure 6.1) surrounded by layers of increasingly peripheral stakeholders. The outermost peripheral stakeholders are linked to the core by intermediary stakeholders who serve as bridges or gatekeepers. County and regional planners (labeled D and E) are not in the core of the network, but instead are at the edges of the network, and interviews indicated that they are connected to emergency managers through weak ties.
The hierarchical structure of Brevard County’s network should suit it well for information consolidation and distribution and to managing the large number of stakeholder organizations (Siegel 2010). It supports planning as a technical information gathering and analysis exercise rather than a discursive process involving sustained and open dialogue, such as argued by Forester (1989, 1993) and other planning theorists. Rather than planners being the technicians criticized for failing to meaningfully engage stakeholders, in this case they are among the marginal stakeholders. In turn, because planners who bring key expertise for grappling with the relationship between land use patterns and policies and hazard risk are essentially absent, theory suggests the network should be poorly equipped to advance land use approaches in its future-oriented mitigation strategy (Siegel 2010). These weaknesses are exacerbated by county planning capacity having been dramatically reduced through budget and staff cuts in recent years.

The limited involvement of planners and weak ties to emergency managers are evident in Brevard County’s weak land use integration of land use into its mitigation plan. Brevard Prepares’ formal institutional structure and hierarchical network structure appear to have evolved not to advance (or even just consider) land use approaches but to manage the competing desires for federal funding among the stakeholders who use the mitigation plan to generate wish lists of “every dream project we’ve ever wanted to do,” as one interviewee said. Other factors played major roles in the limited integration of land use into mitigation efforts as well – possibly even more important roles than the network characteristics. These factors included the atomized and highly centralized approach taken by the consultant, the state of Florida’s emphasis on project prioritization, the county being hampered by a lack of mitigation funding, a pro-development political climate, and cuts to the county planning department.

In comparison to Brevard County, Martin County’s network was much smaller and had more of an opinion leader network structure (Figure 6.2).5 Network theory indicates that Martin County’s

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5 As explained in Appendix III, the planning organization shown in Figure 6.2 (diamond labeled B) is a regional planning organization, not the county growth management department, which is slightly confusing.
opinion leader network should be highly dependent on the emergency managers because of their highly central role, which was confirmed through interviews (Siegel 2010, Berado and Scholz 2010.) Weak bridging ties were present from central emergency managers (triangle labeled A) to peripheral local planners (Burt 2001), who engaged in traditional patterns of exchange (e.g. working on emergency preparedness and response plans) (Kartez and Faupel 1994). In comparison to Brevard County, Martin County had greater involvement of local planners previously in developing its mitigation plan in the 2005 process. But, in comparison to Onslow County and New Hanover County in North Carolina, local planners were less involved in the most recent plan update in 2009 and 2010.

The detailed but dated review of land use capabilities in Martin County’s mitigation plan reflects planner involvement in the 2005 planning process but no involvement in the 2009 update process. Given the county’s strong development management history, the lack of future-oriented land use approaches is very surprising. In contrast to Brevard County’s shrinking planning department, Martin County has an active growth management department that was under-utilized for mitigation purposes. In interviews local emergency management and planning officials expressed a view of mitigation planning as more or less a dead-end capital project prioritization effort that does not feed back into policy-oriented comprehensive planning. Thus, it appears that in addition to influencing the plan’s Prioritized Project List, the state’s approach more fundamentally influenced local views on what constitutes mitigation and the lack of involvement of local planners in mitigation efforts.

Further, by directing so much local attention to planning with an eye towards future federal funding – federal funding that has been very difficult for local officials to secure in a timely and efficient manner – Florida’s approach appears to have had the had the unintended consequence of creating widespread local disillusionment with mitigation planning under the LMS framework.

The regional planning organization was represented by an emergency planner who did not have land use training. County growth management planners were involved in the 2005 planning process but not the 2009 planning process and are not represented in Figure 6.2. Thus, the network image in Figure 6.2 is technically correct because it shows the regional planning organization in a peripheral position and true to the overall interpretation because county planners were peripherally involved in the earlier planning process.
Before discussing the two North Carolina cases, an additional Florida-specific point merits attention. First, a promising step towards greater integration of land use and emergency planning efforts is emerging in Martin County as the county growth management agency has partnered with the emergency management agency to lead a Post Disaster Redevelopment Planning process. Emergency managers, whose agency received the funding for the plan, recognized the value of having local planners coordinate the planning process. Planners could more effectively involve a wide array of stakeholders capable of grappling with complex and contentious issues about future development in the community that might arise following a major disaster. Emergency managers and planners alike understand the critical linkages between their core responsibilities. However, using a post-disaster recovery plan that likely will have its greatest impact in the aftermath of a disaster – but not a mitigation plan that can have its greatest impact now – to make these connections is indicative of the pervasiveness of the reactive pre-Disaster Mitigation Act approach to hazard risk reduction.

Onslow County’s network is nearly identical to Martin County’s in overall structure, exhibiting an opinion leader structure highly dependent on emergency managers (Figure 6.3). Weak bridging ties were present between emergency managers (triangle labeled A) and county and municipal planners (diamonds labeled B and C). Local planners in Onslow County were marginally more involved in the most recent update process than in Martin County. Yet, Onslow County has experienced more changes in key staff in recent years, including the directors of the planning and emergency management agencies. Aside from the state policy context, a key difference in the two counties is the much more permissive development management program in Onslow County, which results from a pro-development, anti-regulation political climate.

Together, the similar network characteristics but different political contexts and state approaches explain most of the key differences in planning outputs between Martin County and Onslow County. The involvement of local planners, albeit peripherally, contributed to Onslow County’s solid capability assessment. Yet, in spite of Onslow County’s much weaker local land use policies and overall development management program, it has integrated more land use actions into
its future-oriented mitigation strategy than Martin County. North Carolina’s more flexible approach to supporting local mitigation planning has encouraged incorporation of a broader array of mitigation approaches. Onslow County lags far behind Martin County on actual implementation of land use approaches with mitigation benefits, however. Whereas Martin County enforces stringent regulations that significantly constrain development in hazardous areas, Onslow County does not strictly limit development in hazardous areas.

Of the four cases, New Hanover County has the strongest stakeholder network for integrating land use approaches to mitigation (Figure 6.4) and is making the land use – hazard mitigation connection most thoroughly. A comparatively stable, medium-sized network, the New Hanover County network exhibited some small world characteristics that were lacking in the other networks (Siegel 2010). Specifically, it contained a balance of bonding ties between an interdependent core of county emergency managers (triangle labeled A), county and municipal planners (diamonds labeled B and C and D respectively) and other stakeholders and bridging ties to a diverse array of peripheral stakeholders. New Hanover County’s network also exhibited the greatest involvement of local planners and the most traditional exchanges and non-traditional exchanges (e.g. emergency managers reviewing subdivision proposals), which are evidence of strong bonding ties. Perhaps most telling is that the Emergency Management and 911 Communications and Planning and Inspections departments jointly led the mitigation planning process. These characteristics made New Hanover County’s network the strongest of the four in terms of sustained cooperation, coordination, and trust between emergency managers and local planners (Forester 1989) and joint problem solving and collaboration around land use approaches to mitigation (Innes and Booher 2010, Scholz et al. 2008). The participation of New Hanover County and its largest municipality, Wilmington, as Project Impact pilot communities in the late 1990s and early 2000s helped establish the strong tradition of connections between land use and hazard mitigation that have been maintained through to today.

The positive influence of these network characteristics, along with aspects of the state policy context and local community characteristics, on land use planning outputs has been borne out in New
Hanover County. The county’s set of mitigation actions is not only the strongest of the four plans but it is among the broadest and most innovative of the 175 jurisdictions assessed in the quantitative phase of this dissertation. Emergency managers and planners alike emphasized the central position of planners and strong bonding ties between the two departments as key reasons for the strong land use emphasis in the mitigation plan. In comparison to Onslow County, which had a similar population, similar hazard experiences and an identical state policy context, close ties between emergency managers and planners in the New Hanover County network core appears to have been a central advantage for incorporating land use into the plan. Although it was beyond the scope of these cases to systematically examine the factors leading to the stronger mitigation network in New Hanover County, a number are plausible. In comparison to Onslow County, New Hanover County has a political climate more amenable to regulation, a stronger planning history and planning department, more extensive inter-governmental cooperation, a more diversified economy, higher levels of wealth, and more urbanization.

Before concluding this chapter, it is important to note that while the Brevard County and Martin County cases and the quantitative plan quality data showing few plans include land use approaches suggest Florida jurisdictions are missing opportunities to advance land use approaches in their plan, at least one Florida county provides a compelling counter-example. Godschalk indicates that “the Lee County approach offers a model collaborative process and a set of mitigation and comprehensive plan policies whose integration could not be more complete and effective” (Godschalk 2010, page 74). A review of the most recent update to the Lee County LMS show that it includes a ranked list of mitigation initiatives (i.e. discrete projects) similar to many other plans in the sample used in this dissertation (Lee County Local Mitigation Strategy Work Group 2010, Section VII). But the Mitigation Initiatives section of the LMS also includes an Approved Action Plan that goes beyond the ranked projects to detail other ongoing mitigation programs, including policy enforcement. The ongoing programs are organized by FEMA categories (i.e. preventative, property protection, etc.) Among the multiple preventative land use-oriented activities in the Approved Action
Plan are: supporting Lee Plan initiatives and land development and regulations, purchasing land parcels for open space preservation in hazardous areas, and continued enforcement of floodplain and other land development regulations. Notably, the action plan identifies not just responsible agencies and timelines for the initiatives but precise estimated cost and specific funding sources, such as $3,341,256 from an unincorporated Municipal Services Taxing Unit.

At the same time that Lee County provides a counter-example of strong integration of land use and mitigation planning compared to Florida communities included in the case studies and regression analysis, characteristics of the local mitigation network in Lee County appear to reinforce the findings in this dissertation. Godschalk concludes that consistent leadership was critical for Lee County’s mitigation planning success (2010). Emergency managers and planners have worked together closely for 30 years and strong mitigation leaders dating back at least 20 years. Additionally, the county Public Safety Department leads mitigation planning efforts and its Director is trained in both emergency management and comprehensive planning. Thus, the Lee County example points to the importance of strong bonding connections between emergency managers and planners, including an ideal situation in which the primary mitigation agency is led by someone whose own training bridges the expertise divide.
Figure 6.1: More is Less in Brevard County
Local, state, and federal emergency managers form core of large, hierarchical network structure with peripheral fans linked to core by intermediaries and planners at edges of network.

Organization Expertise Type
- Emergency Management
- Planning
- Other Expertise
Figure 6.2: Strong but Stove-Piped in Martin County
Planners leading historically strong growth management program are peripheral in small, emergency management-centered opinion leader network structure.
Figure 6.3: Tenuous Ties in Onslow County
After recent turnover in key positions opinion leader network structure is centered on emergency management with peripheral involvement of planners.
Figure 6.4: Making the Connections in New Hanover County
Strong, stable bonding connections between emergency managers and local planners form core of moderate-sized network with a diverse array of peripheral stakeholders.

Organization Expertise Type
- ▲ Emergency
- ▼ Management
- ◇ Planning
- ● Other Expertise
6.3 Conclusion

Comparative analysis of the four cases indicates that more central involvement of planners, stronger ties to emergency managers, and an overall network structure with at least some small world characteristics contribute to greater incorporation of land use approaches in mitigation efforts. Yet, a key conclusion from the cases must be that in spite of the relative strengths of New Hanover County’s network and plan, none of the planning processes approached the conditions required for collaborative rationality that theorists argue should to lead to better planning outputs and outcomes (Innes and Booher 2010). In terms of inclusion of a diverse array of stakeholders, the Brevard County and New Hanover County processes engaged government and non-governmental stakeholders, but the Martin County and Onslow County processes consisted overwhelmingly of government officials. All four counties were unsuccessful in eliciting participation of real estate and development representatives, environmental or neighborhood groups, or the general public. This lack of involvement fits with previous research that finds public involvement in mitigation planning to be low and difficult to foster and points to the huge challenge facing emergency managers and local planners working on mitigation (Godschalk, Brody and Burby 2003, Prater and Lindell 2000). More importantly, the interaction of the full set of stakeholders in each of the four processes was limited to a few meetings, or even just one meeting.

Thus, there is little evidence that the stakeholders in any of the processes engaged a diverse array of stakeholders in extensive discourse that dealt with topics such as unsustainable development patterns, building resilience, and inequitable exposure to hazards. The lack of opportunities for meaningful discourse is a critical shortcoming in the mitigation planning assessed in this dissertation. These observations are important because while there is considerable variation among the four cases in regard to their networks and planning outputs, none of the cases can be held up as a model approaching an ideal collaborative planning process.
Chapter 7

Conclusions

The central aim of this dissertation is to explain if and how variations in the involvement of local planners in stakeholder networks has led to stronger land use-related outputs in hazard mitigation planning efforts. The findings from Chapters 5 and 6 highlight the importance of considering stakeholder networks and interactions between local planners and emergency managers in those networks when seeking to understand the success, or lack thereof, in planning efforts. This chapter revisits the hypotheses from Chapter 3 and makes concluding observations based on these findings. Then, it points to additional research questions and analyses that merit attention from scholars. Finally, it provides six main recommendations specific to hazard mitigation policy and practice.

Using hazard mitigation planning as the policy domain of interest, this research has built on previous studies that have shown a combination of state-level (e.g. planning mandate design and inter-governmental relations) and local-level factors (e.g. socio-economic capacity, experience with hazards, and growth pressures) to drive hazard mitigation planning (see, for example, Burby and Dalton 1994, Berke et al. 1996, Deyle and Smith 1998, Godschalk et al. 1999). Here, the intent is to extend current knowledge by drawing on the concepts, theories and tools of Social Network Analysis (SNA) to develop deeper insights into who participates in hazard mitigation planning and implementation efforts (Wasserman and Faust 1994 and Knoke and Yang 2008). Emphasis is placed on understanding the diversity of assets that stakeholders bring to planning processes and how the patterns of interaction between stakeholders form a network structure that enables or constrains
successful mitigation. Particular attention is paid to four typologies of network structure with different implications for stakeholder interactions (Siegel 2010) and to bonding and bridging connections in the networks (Burt 2001), especially across the expertise boundary between emergency managers and local planners (Kartez and Faupel 1994, Schneider et al. 2003). By leveraging the concepts and methods of Social Network Analysis this dissertation creates new knowledge useful for refining how we understand communication and collaboration in planning processes. Investigating the strength of bridging and bonding ties across an expertise boundary that might otherwise result in communication distortions (i.e. the emergency management-land use planning boundary) extends our understanding of factors that can enhance or encumber the development of trust, cooperation and coordination that Forester and other planning theorists argue persuasively are critical for effective planning (Schneider et al. 2003, Forester 1989 and 1993, Innes and Booher 2010). Exploring if and how the strength and importance of emergency manager-local planner ties are conditioned on different structures of empirically measured stakeholder networks explicitly accounts for broader contextual factors – interpersonal and inter-organizational relationships – that can affect the actions of individual stakeholders (Wasserman and Faust 1994, Siegel 2010, Dempwolf and Lyles 2011). Application of these network-oriented concepts is used not just to understand the networks as ends unto themselves, but also to explain variation in planning outputs of interests to planning scholars and practitioners alike. These insights may be relevant to other planning domains in which stakeholders are embedded in a complex network of inter-dependent individuals and organizations working to generate high-quality planning outputs. They may be especially useful in planning domains that are typically led by officials with expertise other than planning (e.g. transportation planning often led by engineers, climate change adaptation planning often led by environmental scientists, and natural resource planning often led by foresters, geologists, or agricultural specialists).
7.1 Hypotheses Revisited and Concluding Observations

7.1.a. Hypotheses Revisited

This section revisits the four main hypotheses presented in Chapter 3 based on the findings from the regression models and case studies. Hypothesis 1 related to involvement of local planners in mitigation planning is addressed by the regression findings from phase 1 of the dissertation. Hypotheses 2a, 2b and 2c related to the influence of planner involvement in stakeholder networks are addressed by the case study findings from phase 2. Overall, the hypotheses are supported.

Ambiguities and unexpected findings point to potential future research topics.

Hypothesis 1: Inclusion of local planners in hazard mitigation stakeholder networks will lead to greater incorporation of land use approaches in hazard mitigation planning outputs, accounting for the state planning policy context, the local community characteristics, and the diversity of the stakeholder network.

The regression results provide strong evidence that, controlling for the diversity of stakeholders involved in the planning process, the state planning policy context, and local community characteristics, involvement of local planners in mitigation planning is related to the incorporation of more land use approaches in future oriented policies in hazard mitigation plans and more implementation information for those land use approaches. The apparent influence of planner involvement depends on a jurisdiction being represented by its own planner, rather than simply having a planner from another jurisdiction in the planning network. There was not clear support for a relationship between local planners and assessment of land use approaches in the fact base, which appear to be driven much more by the presence of a state mandate for comprehensive planning.

Hypothesis 2a: When local planners are included in hazard mitigation stakeholder networks, their inclusion in more central positions in the stakeholder network will lead to greater incorporation of land use approaches in mitigation planning outputs, accounting for the state planning policy context, the local community characteristics, and the diversity of the stakeholder network.

The case study findings provide support for the hypothesis that more central involvement of local planners will lead to greater incorporation of land use approaches in mitigation planning outputs. New Hanover County had the only network with planners in central positions and had the strongest incorporation of land use in its mitigation plan, especially in the future-oriented aspects of
its plan. The involvement of not just county planners but also municipal planning and zoning staff members further demonstrates recognition of the critical role of local planners in hazard mitigation efforts. No other case county came close to involving as many local planners or involving them in such central positions in the networks.

The Martin County case also points to the importance of having local planners in more central positions. In its planning process for the plan adopted in 2005, county planners were involved much more than in the planning process for the 2010 plan. In line with the greater involvement of planners in the earlier process, assessment of land use approaches in place before adoption of the 2005 plan is very detailed, whereas there is essentially no new information related to land use approaches in the 2010 version of the plan.

*Hypothesis 2b:* Stronger relationships between emergency managers and local planners will lead to greater incorporation of land use approaches in mitigation planning outputs, accounting for the state planning policy context, the local community characteristics, and the diversity of the stakeholder network.

The case study findings also support the hypothesis that stronger relationships between emergency managers and local planners will lead to greater incorporation of land use approaches in mitigation efforts. New Hanover County’s local planners and emergency managers described strong bonding connections. They stressed the strength of their ties to each other and the importance of those ties for shaping the hazard mitigation plan and supporting its ongoing implementation. In the other three case studies, the emergency managers and local planners described weaker, bridging ties. The reasons for the lack of strong ties in the three counties varied from recent staff reductions (Brevard County) to historically stove-piped areas of responsibility (Martin County) to turnover in key leadership positions and reorganization of responsibilities (Onslow County). In all three counties, though, there was recognition among interviewees of mitigation planning benefits that could be gained through stronger bonding ties between emergency managers and local planners.
Hypothesis 2c: Structures of hazard mitigation stakeholder networks that support collaborative joint problem solving will lead to greater incorporation of land use approaches in mitigation planning outputs, accounting for the state planning policy context, the local community characteristics, and the diversity of the stakeholder network.

Finally, there appears to be some support for the hypothesis that structures of networks more supportive of collaborative joint problem solving lead to greater incorporation of land use approaches in mitigation efforts. While none of the networks in the case study counties are prototypical small world or village networks hypothesized to be associated with collaborative joint problem solving (Scholz et al. 2008, Innes and Booher 2010, and Siegel 2010), the New Hanover County network exhibits more of the characteristics of those network types than the other three stakeholder networks. In particular the core stakeholders in New Hanover County, who were instrumental in crafting the strong land use oriented aspects of its mitigation strategy and have responsibility for its ongoing implementation, were linked in a small-world type configuration. Brevard County’s network also had a core group of stakeholders with many interconnections. However, the core was smaller and was dominated by emergency managers and the structure of the stakeholders outside the core was more clearly hierarchical. In Martin County and Onslow County, the stakeholder networks had opinion leader structures with preferential attachment better suited to command-and-control operations.

7.1.b. Related Findings and Considerations

The regression and case study findings demonstrate that the state planning policy context and local community characteristics were influential as well. From the regression models, a strong positive influence of state planning mandates, especially those requiring hazard elements, was found for assessing land use approaches in the fact bases of mitigation plans and including implementation information for land use policies and actions. Somewhat surprisingly, state planning mandates were not related to incorporation of land use approaches as future-oriented policies or actions. A somewhat unexpected finding was the negative influence of a higher number of recent major disasters on incorporation of land use approaches into mitigation plans. This finding points to the ongoing
influence of communities focusing attention on securing post-disaster federal funding rather than considering long-term, land use related approaches in the wake of hazard events.

From the case studies, the influence of the difference in state planning policy approach in Florida and North Carolina is particularly evident. In Florida, land use approaches received extremely limited attention in the future-oriented parts of Brevard County and Martin County mitigation plans, while in North Carolina, Onslow County and New Hanover County included multiple future-oriented land use approaches. Notably, Onslow County and Martin County have very similar network structures and if anything Martin County’s local community characteristics should have resulted in much more incorporation of land use approaches than Onslow County. Instead, emphasis on top-down, project oriented aspects of Florida’s approach appears to have contributed to limited attention to future-oriented land use approaches in Martin County’s mitigation plan and may explain the cursory involvement of land use planners in mitigation planning. North Carolina’s flexible approach appears to have encouraged, or at least did not preclude, Onslow County’s incorporation of land use actions in its mitigation strategy. In terms of actual implementation of risk reducing land use policies, though, Martin County far surpasses Onslow County. This difference is largely due to Martin County’s much stronger land use regulatory framework and a political climate much less favorable to development than observed in Onslow County.

In North Carolina, the influence of local community characteristics is also evident. New Hanover County and Onslow County have the same state planning policy context and very similar experience with past hazards, but New Hanover County has a network structure more suited to collaborative problem solving than Onslow County, which has an opinion leader network with preferential attachment. New Hanover County’s higher wealth, history of inter-government cooperation, and greater urbanization have contributed to a strong planning capacity and may also explain its network structure more suited to collaborative joint problem solving. Thus, there is some evidence of the factors that may influence the types of network structures needed to increase the incorporation of land use approaches into mitigation efforts.
From a research design standpoint, the four cases cannot be used to isolate the separate influences of the centrality of planners, emergency manager-local planner ties, and network structure. That is because New Hanover County is the only case to have planners in central positions in its network, strong bonding ties between emergency managers and local planners, and a network structure somewhat oriented towards collaborative joint problem solving that has planners in key positions. Speculatively, however, the interviews with New Hanover County stakeholders point to the central role of planners and the strong ties between emergency managers and local planners as having been more influential than the network structure.

Importantly, this reasoning does not argue against the potential value of collaborative joint problem solving structure, instead it suggests that bridging the emergency management–land use planning boundary with strong ties is of primary importance for integration land use into mitigation efforts. The overall structure of the network is of secondary importance for integrating land use approaches but may be of critical importance for other planning outputs (e.g. developing shared visions and goals and building local commitment), which were beyond the scope of this dissertation’s investigation. Additional research into the bridging ties with non-planning stakeholders and their value for mitigation planning could provide insights into the influence of overall network structure on mitigation efforts more broadly conceived.

7.1.c. Concluding Observations

Six main conclusions are drawn from the combined regression and case study findings.

1. Greater involvement of local planners and stronger ties to emergency managers can contribute to more integration of land use approaches into mitigation plans and more implementation of land use approaches with mitigation benefits over time.

2. A strong core of multiple types of stakeholders – as opposed to emergency management officials alone serving as the hub – and a balance of strong bonding ties between core stakeholders and bridging ties to a diverse array of peripheral stakeholders can contribute to stronger mitigation planning.

3. A shortcoming in the post-disaster funding driven approach promoted through the Local Mitigation Strategy approach in Florida – and the Disaster Mitigation Act more broadly – is the limited emphasis placed on land use approaches that require regulatory change rather than securing federal disaster grant funding that may fail to materialize.
4. No single local profile leads to greater inclusion of land use approaches to mitigation and local socio-economic, development and hazard experience characteristics can combine to increase – or encumber – attention to land use approaches to mitigation.

5. Local governments rely heavily on consultants to develop mitigation plans and differences in the approaches taken by the consultants influence the content and usefulness of the plans (see case study appendices for more information about the role of consultants).

6. The current process used by FEMA to approve local hazard mitigation plans misses opportunities to considerably strengthen mitigation efforts nationwide. The current binary approval process – in contrast to the points system used in the Community Rating System for example – encourages communities and the consultants helping them to develop their plans to aim for the minimum possible standard for approval (see Appendices II – V, in particular sections V.3 and V.8). Without strong incentives from federal and state governments to develop better plans, it appears communities without strong local motivations and high planning capacity will hesitate to invest much time or resources to do so.

7.2 Future Research and Policy Recommendations

7.2.a. Future Research Recommendations

The recommendations for future research extend from two issues: 1) limitations of this research project and 2) the substance of the findings. As with nearly all research, more data would be beneficial. In particular, more data on network structure would be particularly valuable, especially observational data (e.g. verbal exchanges from meeting minutes, email exchanges, and even social media communications such as tweets) as a powerful complement to respondent-generated data (e.g. surveys and interviews). Additionally, the case study results indicate that the stakeholder networks change in composition and structure over time, including in response to the availability (or lack thereof) of federal funding. Measuring mitigation stakeholder networks repeatedly over time (including pre- and post-disaster) and linking that data to longitudinal datasets for planning outputs and outcomes would be powerful. More data on ongoing implementation (e.g. actions taken on specific development proposals) and planning outcomes (e.g. changes in land use patterns and post-disaster evaluations of losses avoided) would certainly help refine the conceptual framework even further.
Also, as noted in Chapter 5, the regression models would be more informative if measurement of some variables (e.g. state mandate and planner involvement) was less coarse and provided more nuance. Generating such variables would require a combination of new data and creation of new indices or measures. More cases in non-mandate states would increase understanding and make case study findings more suitable for generalization, while more cases in communities with strong integration of land use could provide additional best practices to help inform practice. Together, these data and analyses would help answer the questions posed here even better and likely result in new questions as well.

In response to the findings, a number of new research topics and questions come to the surface. First, this dissertation provides evidence that the assets that local planners bring to mitigation planning and the strength of their ties to emergency managers are important for developing high quality plans. Further analysis along these lines could extend the work begun by Kartez and Faupel (1994) on these relationships. Particular topics meriting more investigation include, but are not limited to, the specific assets that makes planners valuable for mitigation efforts, what conditions foster effective communication between planners and emergency managers and how existing ties from emergency preparedness, response and recovery efforts can be better leveraged in mitigation. Additional research on the professional experiences of emergency managers (and planners) like the one in Lee County, FL (Godschalk 2010) who have both emergency management and land use training may provide important insights into how the expertise boundary can be bridged more effectively.

Second, this project could only provide a surface understanding of how the actual planning processes unfolded over time and whether the interactions between stakeholders approach collaborative joint problem solving ideals. Deyle and Slotterback (2009), using a pre-test, post-test quasi-experimental design provide one of the few analyses along these lines. A major gap in knowledge remains. A combination of systematic large sample analysis of planning process metrics –
such as might be enabled by observational network data – coupled with detailed longitudinal case studies – perhaps with participant observation as a key component – would be valuable.

Third, while the cases provided little indication that active anti-mitigation or anti-regulation advocacy coalitions opposed to using land use approaches to reduce hazard risk were directly involved in mitigation planning, further research is needed on the topic of disasters as inherently political events (Olson 2000). The reluctance to more overtly address land use issues in mitigation planning expressed by one emergency manager interviewed in this study stemmed from a desire not to politicize mitigation efforts, which is arguably an example of a “non-decisionmaking screen” stifling debate before it begins (Olson 2000, 274). Thus, in some counties the power of anti-land use regulation coalitions may be so large that local officials decide it is not worth the political risk to pursue more aggressive development regulations. Avoiding conflict in pre-disaster planning is a high-stakes form of rolling the dice, however, as disasters often effectively poke holes in the non-decisionmaking screen and bring a complex array of conflicts to the surface, sometimes quite painfully (Olson 2000). More in-depth examination of the broader political environments related to land use regulation was beyond the scope of this project, but would be very useful for understanding success in promoting land use approaches to mitigation.

Fourth, more information is needed about the role of private and public-sector consultants in mitigation planning processes. Important topics include the assets and attributes of the consultants (e.g. training as planners, emergency managers, or engineers and familiarity with local context), the organizational affiliations of the consultants (e.g. planning firms, engineering firms, and regional planning organizations), the approaches used to develop different components of mitigation plans, and the comparative strengths and weaknesses of those approaches. Research along these lines will help determine how to explicitly include consultants in the conceptual framework guiding this research. Fourth, comparative research on the influence of mandated planning (i.e. DMA-compliant efforts) versus incentivized planning (i.e. Community Rating Systems efforts), such as done by Berke, Lyles and Smith (http://www.ie.unc.edu/cscd/publications.cfm) could provide better
understanding of the implications of the current binary approval process for mitigation plans as compared to alternative evaluation processes. Finally, for more than a decade there has been consensus on the central role land use approaches should have in national, state and local mitigation efforts (Burby et al. 1999, Godschalk et al. 1999 and Mileti 1999). Nonetheless, there is no incentive or requirement in the DMA for local communities to consider, much less utilize land use approaches. To be able to make the argument for such modification to federal, state and local policy even more forcefully, more research that provides a clear and traceable linkage between mitigation planning, land use policy change, and tangible benefits – or at least costs not incurred – would be very helpful.

7.2.b. Policy and Practice Recommendations

The recommendations for practice and policy follow directly from the practical implications of the six main conclusions above. First, local planners bring unique knowledge and skills to mitigation planning efforts. Local emergency managers and planners should work to increase the strength of their connections on mitigation issues. A starting point could be leveraging existing connections on other initiatives, which could extend to greater frequency of interaction, joint projects, and shared commitment to more use of land use approaches to mitigation over time. Similarly, state and federal officials should actively foster stronger ties between emergency managers and local planners. FEMA’s recently announced “Whole Community” initiative is very much in line with this recommendation and holds considerable promise if federal, state, and local mitigation officials pursue its vision with vigor and commitment (FEMA 2011). FEMA and states should consider adding elements to mitigation plan review criteria that emphasize and/or require involvement of local planners – or those with land use responsibilities in the absence of local planners – as part of the participation component of mitigation plans.

Second, while there is not an ideal, one-size-fits-all network structure, there appear to be key network characteristics (e.g. a balance of bridging and bonding ties and a tight core of stakeholders) that need to be fostered. Local, state and federal officials can all make a more conscious effort to think in these network terms. One of the strategic themes of the Whole Community approach is to
“leverage and strengthen social infrastructure, networks, and assets” (FEMA 2011, page 5.) In line with this theme, mitigation officials need to be encouraged not to think of stakeholders simply in terms of invitee lists for meetings or potential grant recipients, but as a dynamic web of people and organizations with a wide range of assets and interdependent interests. Incorporating network concepts such as bridging ties and network structure into the lexicon of mitigation officials can help officials to more effectively target outreach efforts and strategically select relationships to foster.

Third, while the federal DMA policy framework was intended to move the nation towards a more proactive and comprehensive approach to mitigation, it still needs to be shifted farther away from the post-disaster, funding driven approach. At the federal level, this could be done through changes to requirements for the contents of mitigation plans (e.g. requiring a diversified array of mitigation approaches for which detailed implementation information can be provided – not just wish lists). It could also be done through re-allocating a greater share of federal disaster funding to pre-disaster programs, although recent federal decisions have imperiled the future of the Pre-Disaster Mitigation Program. At the state level, mitigation officials should emphasize flexible approaches to mitigation that ensure that local officials have low cost mitigation initiatives they can work on in the absence of state and federal grants.

Fourth, although local, state and federal officials have little control over some community characteristics that influence mitigation (e.g. growth pressures, local wealth, etc.) they can help local officials to better understand and work within their own particular context. This assistance can be provided by helping local officials develop better fact bases for their plans – fact bases that not only assess hazard and vulnerabilities but also local capabilities and the interplay between risks and capabilities. Along this line, FEMA could make local capability assessments mandatory elements of local mitigation plans as they do for state mitigation plans.

Fifth, a major gap exists in current understanding of the role of consultants in mitigation planning. While filling this gap is in part a research endeavor, it can also be addressed through practice and policy. For example, FEMA and states could encourage or even require local officials to
ensure that their plans are very explicit about the roles that consultants have played in the
development of their plans. Additionally, FEMA and states could track and publicize expenditure of
planning grant support on consultants.

Finally, while the DMA has been very effective in motivating local jurisdictions to develop
and adopt mitigation plans, it has been less successful in generating high quality plans that
stakeholders view as critical tools in their everyday efforts to make their communities more resilient
and sustainable. FEMA should consider moving away from binary approval decisions for mitigation
plans. Instead, some sort of scaled approach for evaluating plans should be used that rewards
communities for the quality of the plan as a document useful for ongoing decision making and for the
breadth of mitigation approaches included in the future-oriented strategy and for the amount of detail
in the implementation information in the plans. Local communities appear to need stronger
incentives to move away from creating cumbersome, wish-list plans that sit on shelves and collect
dust and toward plans that are reader-friendly, realistic, and regularly used in ongoing decision
situations.
Appendix I

Supplemental Information on Research Design and Methods

Note: Sections here are numbered to match the relevant sections of Chapter 4.

4.2. Phase 1 Sample Selection

4.2.a. State Selection: The state hazard mitigation planning context dimension consists of three measures taken from the IBHS/APA 2008 Survey of State Land Use and Natural Hazards Planning Laws: 1) does the state require local jurisdictions to adopt a plan; 2) does the plan require a hazard-related element, and 3) does the plan require vertical consistency (Schwab 2009). A state with three yeses is considered a 'Strong' state, a state with two yeses a 'Moderate' state, and a state with one or no yeses a 'Weak' state. The state mitigation plan quality dimension was measured by using plan quality data for five plan quality principles (i.e. Fact Base, Mitigation Strategy, Implementation and Monitoring, Planning Process, and Coordination with Local Planning). Plan quality z-scores for each of the principles were added to generate an overall plan quality score. All 30 coastal states were ranked from 1 to 30. The top six scores (the top 20%) were considered 'Strong', the bottom six scores (the bottom 20%) 'Weak', and the middle 18 scores (the middle 60%) 'Moderate'.

4.2.b. Selection of Sample Jurisdictions: There are three notes about the sampling frame. First, the minimum and maximum population levels were used to ensure that the jurisdictions were neither too small to support mitigation planning nor so large as to be fundamentally different in planning capacity or complexity of planning problems faced. Second, the DHS-funded study used a cut-off date of September 30, 2010 for its jurisdiction sampling. That is, if a jurisdiction did not have a state-approved plan ready to be sent to FEMA for review by Sept. 30, 2010, then the older (typically 2005) plan for that jurisdiction was content analyzed. Third, the proportion of sampled counties to municipalities in each state was balanced to correspond to the proportion of counties to municipalities in the sampling frame for that state.
4.3 Phase 1 Data Collection

4.3.a.1. Plan Collection: Dates of adoption of the plans in the sample ranged between 2003 and 2010. The majority of the plans were multi-jurisdictional, involving one or more municipalities and one or more counties. Each plan was converted into a single digital file (i.e. pdf) for coding purposes.

4.3.a.2. Coding Instrument Development and Testing: The state plan coding instrument used in the larger DHS-funded project was revised for use with the local plans based on previous experience with the state plan coding, both in terms of substance and formatting, and in order to ensure that all of the items were applicable to local level mitigation plans. Items were designed to assess the extent to which three direction-setting plan quality principles (i.e. fact base, goals, and policies) are addressed by the plan content (Berke, Godschalk and Kaiser 2006, Berke and Godschalk 2009, Berke, Smith, Lyles and Reynolds 2011). Four action-oriented plan quality principles (i.e. participation, inter-organizational coordination, implementation and monitoring) were also assessed (Berke, Godschalk and Kaiser 2006, Berke and Godschalk 2009, Berke, Smith, Lyles and Reynolds 2011). Item measures were either nominal (1 = present, 0 = not present) or ordinal (2 = present and detailed, 1 = present and mentioned, and 0= not present).

Prior to coding the 175 plans in the sample, the items in the coding instrument were migrated into a content analysis software program, Atlas-ti. Each coder used Atlas-ti to code the plans. The software and items were tested and revised through a series of pre-tests on local plans from South Carolina, a state not included in our sampling frame. This process also allowed us to test the instructions associated with each item in the coding instrument, familiarize ourselves with the software, and make sure that our reliability statistics met agreed-upon standards before coding the plans in our sample.

4.3.a.3. Coding Procedures: The coding process to generate the dataset consisted of the following steps. First, two coders independently coded the plan by uploading the plan as a pdf into an Atlas-ti file that included the coding items and used the software to link the items to the relevant content in the plan pdf. Second, after completely coding the plan, the coders saved their coding file, exported
the quantitative data from the software and typed up qualitative notes about the plans. Third, the two coders’ quantitative data were compared to identify all disagreements on an item-by-item basis. Fourth, the coders went through each disagreement together, referenced their own coding files to determine why they arrived at the coding score they did, and then resolved their differences in a reconciled dataset. Finally, reconciled datasets, along with the each coder’s Atlas-ti file, raw quantitative data, and qualitative data were saved to a master database. This process enabled us to 1) use the raw quantitative data to generate statistics to measure the reliability of our dataset on an aggregate and item-by-item basis; 2) use the reconciled quantitative data in descriptive analysis and statistical modeling; and 3) use the qualitative observations of the coders to highlight best practices found in the plans.

4.3.a.4. Creation of Plan Quality Indexes and Counts: Creation of the capability assessment index consisted of the following process. In the capability assessment, each of these policies was coded on an ordinal scale (2 = present and detailed, 1 = present and mentioned, and 0= not present). For the multi-jurisdictional plans each of the policies was coded as present and detailed or present and mentioned only if it pertained to the specific jurisdiction being coded. For each jurisdiction, the scores for each policy were converted to a 0 to 1 scale by dividing by two and then the sixteen scores were added into an overall sum. This sum was then divided by 16 to adjust for the number of policies and multiplied by 10 to put it on a 0-10 scale, which has been the typical index scale in the plan quality literature (Berke and Godsalk 2009). This calculation is shown in equation 1:

\[
LU_{CA} = \frac{\sum (LU_1/2 + LU_2/2 \ldots + LU_{16}/2)}{16} \times 10
\]

where \(LU_{CA}\) denotes the capability assessment land use index score, and \(LU_n\) denotes the capability assessment scores for each of the sixteen land use policies. As noted in Chapter 4, the reliability of the index was tested using Cronbach’s alpha.

The process of creating the count of proposed land use actions was as follows. As with the preventative capability assessment-land use index, when coding a multi-jurisdictional plan all of the
items in the proposed actions-land use count were coded for the specific jurisdiction being coded. The proposed actions items were coded on a nominal scale (1 = present, 0 = not present). For each jurisdiction, the scores for each policy and action were added up, resulting in a count between 0 and 16. Since the policies and actions are either proposed or not, they are treated as count data rather than converted into an index as was done with the capability assessment.

The process of creating the implementation-land use count was slightly different. For each of the proposed actions included in the plan coding instrument, we also identified whether or not the plan indicated 1) a party responsible for the action, 2) a timeline for implementation, and 3) a project cost for the action. These three types of implementation information were coded on a nominal scale (1 = present and 0 = not present). The implementation-land use count consists of the total number of items of implementation-related information present in the plan for the sixteen types of land use actions and can range from 0 to 48 – three possible types of information present for each of 16 types of land use actions. In statistical analyses using this implementation count as a dependent variable, it was important to include the number of proposed land use actions as an independent variable to account for the inherent limitation in the number of implementation information items when jurisdictions did not include propose all 16 types of land use actions, which was the case for all 175 jurisdictions.

4.5. Phase 1 Variables

4.5.a. Dependent Variables: Table I.1 shows frequencies for each of the sixteen types of land use actions and measures of central tendency for the land use capability index. The frequencies show very few of the plans presented detailed assessment of any of the land use actions. They also show subdivision regulations and permitted land use as the land use actions assessed most frequently.
Table I.1: Descriptive Statistics for Assessment of Land Use Capabilities in the Fact Base

<table>
<thead>
<tr>
<th>Land Use Action</th>
<th>Percent Detailed</th>
<th>Percent Mentioned</th>
<th>Percent Absent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density Bonuses</td>
<td>0.6</td>
<td>0.0</td>
<td>99.4</td>
</tr>
<tr>
<td>Tax Abatement</td>
<td>0.0</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Cluster Development</td>
<td>0.0</td>
<td>4.6</td>
<td>95.4</td>
</tr>
<tr>
<td>Density of Land Use</td>
<td>4.0</td>
<td>31.4</td>
<td>64.6</td>
</tr>
<tr>
<td>Density Transfer</td>
<td>0.6</td>
<td>3.4</td>
<td>96.0</td>
</tr>
<tr>
<td>Land Suitability</td>
<td>1.1</td>
<td>2.9</td>
<td>96.0</td>
</tr>
<tr>
<td>Permitted Land Use</td>
<td>5.7</td>
<td>58.3</td>
<td>36.0</td>
</tr>
<tr>
<td>Setbacks or Buffer Zones</td>
<td>1.7</td>
<td>25.1</td>
<td>73.1</td>
</tr>
<tr>
<td>Site Review</td>
<td>1.1</td>
<td>18.3</td>
<td>80.6</td>
</tr>
<tr>
<td>Special Study</td>
<td>1.1</td>
<td>20.6</td>
<td>78.3</td>
</tr>
<tr>
<td>Subdivision Regulations</td>
<td>5.7</td>
<td>61.1</td>
<td>33.1</td>
</tr>
<tr>
<td>Zoning Overlays</td>
<td>1.7</td>
<td>7.4</td>
<td>90.9</td>
</tr>
<tr>
<td>Site Public Facilities</td>
<td>2.3</td>
<td>8.0</td>
<td>89.7</td>
</tr>
<tr>
<td>Development Moratorium</td>
<td>1.1</td>
<td>1.7</td>
<td>97.1</td>
</tr>
<tr>
<td>Post-Dis. Land Use Change</td>
<td>0.0</td>
<td>1.7</td>
<td>98.3</td>
</tr>
<tr>
<td>Post-Dis Cap. Imp.</td>
<td>0.6</td>
<td>0.6</td>
<td>98.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LU Capability Score</th>
<th>Number of Jurisdictions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1.0</td>
<td>117</td>
</tr>
<tr>
<td>1.0 to 2.0</td>
<td>38</td>
</tr>
<tr>
<td>More than 2.0</td>
<td>20</td>
</tr>
</tbody>
</table>

|                        |                           |
| Mean LU Capability Score | 0.94                     |
| Standard Deviation      | 0.89                     |
| Minimum                 | 0                        |
| Maximum                 | 5.625                    |
| n                       | 175                      |

Proposed Land Use Actions: Table I.2 shows frequencies for each of the sixteen types of land use actions and measures of central tendency for the count of proposed land use actions. The frequencies show subdivision regulations, permitted land use, siting public facilities, and setbacks or buffer zones as the most common actions.
Table I.2: Descriptive Statistics for Proposed Land Use Actions (Policies Principle)

<table>
<thead>
<tr>
<th>Land Use Action</th>
<th>Number of Jurisdictions</th>
<th>Percent Included</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density Bonuses</td>
<td>2</td>
<td>1.1</td>
</tr>
<tr>
<td>Tax Abatement</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Cluster Development</td>
<td>2</td>
<td>1.1</td>
</tr>
<tr>
<td>Density of Land Use</td>
<td>11</td>
<td>6.3</td>
</tr>
<tr>
<td>Density Transfer</td>
<td>2</td>
<td>1.1</td>
</tr>
<tr>
<td>Land Suitability</td>
<td>2</td>
<td>1.1</td>
</tr>
<tr>
<td>Permitted Land Use</td>
<td>38</td>
<td>21.7</td>
</tr>
<tr>
<td>Setbacks or Buffer Zones</td>
<td>29</td>
<td>16.6</td>
</tr>
<tr>
<td>Site Review</td>
<td>16</td>
<td>9.1</td>
</tr>
<tr>
<td>Special Study</td>
<td>4</td>
<td>2.3</td>
</tr>
<tr>
<td>Subdivision Regulations</td>
<td>51</td>
<td>29.1</td>
</tr>
<tr>
<td>Zoning Overlays</td>
<td>4</td>
<td>2.3</td>
</tr>
<tr>
<td>Site Public Facilities</td>
<td>37</td>
<td>21.1</td>
</tr>
<tr>
<td>Development Moratorium</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Post-Dis. Land Use Change</td>
<td>1</td>
<td>0.6</td>
</tr>
<tr>
<td>Post-Dis Cap. Imp.</td>
<td>1</td>
<td>0.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Number of LU Actions</th>
<th>Number of Jurisdictions</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Actions</td>
<td>81</td>
</tr>
<tr>
<td>1 Action</td>
<td>35</td>
</tr>
<tr>
<td>2 Actions</td>
<td>32</td>
</tr>
<tr>
<td>3 Actions</td>
<td>18</td>
</tr>
<tr>
<td>4 Actions</td>
<td>4</td>
</tr>
<tr>
<td>5 Actions</td>
<td>3</td>
</tr>
<tr>
<td>6 Actions</td>
<td>1</td>
</tr>
<tr>
<td>…</td>
<td></td>
</tr>
<tr>
<td>10 Actions</td>
<td>1</td>
</tr>
</tbody>
</table>

Mean Number of Actions 1.14
Standard Deviation 1.46
Minimum 0
Maximum 10
n 175

Implementation Information: Table I.3 shows the distribution of the counts of the pieces of implementation information and measures of central tendency for the counts of implementation information. The distribution of counts shows a majority of the jurisdictions provide 0 pieces of implementation information related to land use actions, which is not surprising considering 81 jurisdictions proposed no land use actions in their plans. Of the remaining jurisdictions including...
implementation information related to land use actions, the majority provide between 2 and 4 pieces of implementation information.

**Table I.3: Descriptive Statistics for Implementation Information (Implementation Principle)**

<table>
<thead>
<tr>
<th>Total Items of Imp. Info.</th>
<th>Number of Jurisdictions</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Pieces</td>
<td>95</td>
<td>54.3</td>
</tr>
<tr>
<td>1 Piece</td>
<td>8</td>
<td>4.6</td>
</tr>
<tr>
<td>2 Pieces</td>
<td>26</td>
<td>14.9</td>
</tr>
<tr>
<td>3 Pieces</td>
<td>12</td>
<td>6.9</td>
</tr>
<tr>
<td>4 Pieces</td>
<td>17</td>
<td>9.7</td>
</tr>
<tr>
<td>5 Pieces</td>
<td>4</td>
<td>2.3</td>
</tr>
<tr>
<td>6 Pieces</td>
<td>6</td>
<td>3.4</td>
</tr>
<tr>
<td>7 Pieces</td>
<td>3</td>
<td>1.7</td>
</tr>
<tr>
<td>8 Pieces</td>
<td>2</td>
<td>1.1</td>
</tr>
<tr>
<td>9 or More Pieces</td>
<td>2</td>
<td>1.1</td>
</tr>
</tbody>
</table>

Mean Number of Items: 1.59  
Standard Deviation: 2.25  
Minimum: 0  
Maximum: 12  
n: 175

**4.5.b. Independent Variables**

**State Planning Mandate:** The data source for state planning mandate is the Institute for Business and Home Safety survey (Schwab 2009). The measurement is three-level, with distinctions made between states with a comprehensive planning mandate that requires a hazard element, states with a comprehensive planning mandate that does not require a hazard element, and states without a comprehensive planning mandate. California, Florida, and North Carolina have mandates requiring a hazards element, Washington has a planning mandate without the hazard element requirement, and Georgia and Texas do not have planning mandates. Thus, 90 jurisdictions (i.e. 30 each from CA, FL, and NC) are subject to mandates with a hazards element requirement, 30 (i.e. 30 in WA) are subject to mandates without a hazard element requirement, and 55 are not subject to a mandate (i.e. 25 in Georgia and 30 in Texas) as shown in Table I.4.
Table I.4: Descriptive Statistics for State Planning Mandate

<table>
<thead>
<tr>
<th>Planner Type</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject to State Mandate w/ Hazards</td>
<td>90</td>
<td>51.4</td>
</tr>
<tr>
<td>Subject to State Mandate w/o Hazards</td>
<td>30</td>
<td>17.1</td>
</tr>
<tr>
<td>Not Subject to State Mandate</td>
<td>55</td>
<td>31.4</td>
</tr>
<tr>
<td>n</td>
<td>175</td>
<td></td>
</tr>
</tbody>
</table>

Involvement of Local Planner: The involvement of local planners was measured as a categorical variable with three categories: jurisdiction’s own planner, other jurisdiction’s planner, and no planner. One explanation for the lack of use of this variable in previous studies may be because most of the existing plan quality studies have focused on plans that were developed through planning processes led by planning agencies, not other agencies such as emergency management. In past studies there would have been little to no variation in the involvement of planners, at least as evidenced in the roster of committee members listed in the plan itself. However, most hazard mitigation planning processes were headed by emergency management agencies. This situation presented an opportunity to test the influence of planners on land use related planning outputs.

The source for this variable was double-coding content analysis conducted in May and June 2011. It supplemented the main plan content analysis of the DHS-funded study, but employed the independent, double-coding and reconciliation procedures recommended in the content analysis literature (Krippendorff 2004). The distribution and frequencies of the three categories of planners is shown in Table I.5. The jurisdictions were fairly evenly distributed across the three categories, with jurisdictions with no planners (28.0%) being slightly lower than jurisdiction’s own planners (35.4%) and other jurisdiction’s planners (36.6%).

Table I.5: Descriptive Statistics for Planner Involvement

<table>
<thead>
<tr>
<th>Planner Type</th>
<th>Number of Jurisdictions</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jurisdiction’s Own Planner</td>
<td>62</td>
<td>35.4</td>
</tr>
<tr>
<td>Other Jurisdiction’s Planner</td>
<td>64</td>
<td>36.6</td>
</tr>
<tr>
<td>No Planner</td>
<td>49</td>
<td>28.0</td>
</tr>
<tr>
<td>n</td>
<td>175</td>
<td></td>
</tr>
</tbody>
</table>
Diversity of Groups Involved: Numerous types of groups can, and arguably should, be involved in hazard mitigation planning, including but not limited to emergency managers, planners, public health officials, public works officials, police, fire, disaster volunteer organization representatives, state agency officials, and elected officials. The data source for this measure is the plan quality dataset from the DHS-funded study. Twenty-two different types of groups were coded as being involved on the official planning committee (1) or not (0). The list of 22 groups is shown in Table I.6. A count of the number of types of groups was generated for use in the regression models by summing the number of types of groups included. Table I.7 shows the distribution, frequency, mean, standard deviation and range for the dataset. The number of groups involved is close to normally distributed, as indicated by the mean, standard deviation and range. The jurisdictions with zero groups involved are those jurisdictions for which the plan did not indicate any committee stakeholders.

Table I.6: Stakeholder Group Types

<table>
<thead>
<tr>
<th>Group Type</th>
<th>Group Type</th>
<th>Group Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Department/Permit Office</td>
<td>Fire Department</td>
<td>Public Health Agency</td>
</tr>
<tr>
<td>Business Groups</td>
<td>Housing Agency</td>
<td>Public Works</td>
</tr>
<tr>
<td>Developers/Homebuilders</td>
<td>Media</td>
<td>Regional Planning/Gov.</td>
</tr>
<tr>
<td>Disaster Volunteer Group</td>
<td>Neighborhood Groups</td>
<td>School District</td>
</tr>
<tr>
<td>Elected Officials</td>
<td>Parks/Land Cons./Env. Agency</td>
<td>Transportation Agency</td>
</tr>
<tr>
<td>Emergency Management</td>
<td>Police Department</td>
<td>Utilities</td>
</tr>
<tr>
<td>Environmental Groups</td>
<td>Professional Orgs (e.g. APA)</td>
<td>Water/Sewerage District</td>
</tr>
<tr>
<td>State Emergency Management or Natural Resource/Environmental Agency</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table I.7: Descriptive Statistics for Committee Diversity

<table>
<thead>
<tr>
<th>Number of Groups Identified in Plan</th>
<th>Number of Jurisdictions</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero</td>
<td>6</td>
<td>3.4</td>
</tr>
<tr>
<td>One to Five</td>
<td>50</td>
<td>28.6</td>
</tr>
<tr>
<td>Six to Ten</td>
<td>80</td>
<td>45.7</td>
</tr>
<tr>
<td>Ten or More</td>
<td>39</td>
<td>22.3</td>
</tr>
</tbody>
</table>

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>7.47</td>
<td></td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>3.85</td>
<td></td>
</tr>
<tr>
<td>Minimum</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Maximum</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>175</td>
<td></td>
</tr>
</tbody>
</table>
Population Density: Population density can serve as an indicator of limited land remaining for development, which in turn may lead a community to allow development of hazardous areas because the community has few other areas to accommodate growth. The data source for population density is the 2000 Census, using the 2000 population and the land area. Density was calculated by dividing the 2000 population by the land area. The mean population density is 775.7 persons per square mile, as shown in Table I.8.

Table I.8: Descriptive Statistics for Population Density

<table>
<thead>
<tr>
<th>Density (People/km²)</th>
<th>Number of Jurisdictions</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 100.0</td>
<td>41</td>
<td>23.4</td>
</tr>
<tr>
<td>100.0 to 999.99</td>
<td>86</td>
<td>49.1</td>
</tr>
<tr>
<td>1000.0 or more</td>
<td>48</td>
<td>27.4</td>
</tr>
<tr>
<td>Mean</td>
<td>775.7</td>
<td></td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>935.5</td>
<td></td>
</tr>
<tr>
<td>Minimum</td>
<td>3.7</td>
<td></td>
</tr>
<tr>
<td>Maximum</td>
<td>7,825.2</td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>175</td>
<td></td>
</tr>
</tbody>
</table>

Population Growth: Population growth serves as an indicator of growth pressures that jurisdictions face as new people move to the jurisdiction and new housing, schools, and other services must be provided. Increased growth pressure may lead to more attention to hazard mitigation planning because communities may begin to run out of land suitable for development and they may wish to use planning to manage growth more systematically. Alternatively, growth pressures may lead to less attention to hazard mitigation planning because communities may seek to accommodate growth wherever they can in order to build their tax base.

The data sources for the population growth variable are population estimates for the period 1994 to 2009 and metadata from the collection of the plans for the DHS-funded study. The metadata indicated the year of adoption of the plan. The population estimates from the Census were then used to calculate the percent population growth in the ten years prior to the adoption of the plan. This approach was taken rather than measuring the same ten-year period for all jurisdictions because the plans were adopted over a rolling seven-year period.
Table I.9 shows the frequencies of different ranges of population growth rates as well as measures of central tendency. The mean growth rate of 17.1% is higher than the growth rate of 9.1% for the United States estimated by the Census Bureau for the 2000 to 2009 period, which roughly corresponds to the range used in this dataset. This higher growth rate is not surprising since all of the states in the sample are in the south and west, which are growing faster than other areas of the country.

Table I.9: Descriptive Statistics for Population Growth

<table>
<thead>
<tr>
<th>Growth Rate (Percent)</th>
<th>Number of Jurisdictions</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than -10.00</td>
<td>5</td>
<td>2.9</td>
</tr>
<tr>
<td>-10.00 to 0.00</td>
<td>31</td>
<td>17.7</td>
</tr>
<tr>
<td>0.01 to 9.99</td>
<td>55</td>
<td>31.4</td>
</tr>
<tr>
<td>10.00 to 24.99</td>
<td>46</td>
<td>26.3</td>
</tr>
<tr>
<td>Greater than 25.00</td>
<td>38</td>
<td>21.7</td>
</tr>
</tbody>
</table>

Mean: 17.1
Standard Deviation: 26.9
Minimum: -18.0
Maximum: 163.4
n: 175

Median House Value: Overall community wealth can serve as an indicator of many types of capacity relevant to developing and implementing a mitigation plan. Through direct resources such as tax collections, higher levels of community wealth can provide more resources to employ planning staff, conduct technical analyses, contract with consultants, and engage the public. Higher levels of wealth can also provide greater resources to promote mitigation to residents, employ staff to implement mitigation actions, monitor and update a plan, and otherwise engage in a comprehensive mitigation program.

The data source for community wealth data was the 2000 Census. The measure of community wealth was the median owner-occupied home value, as has been commonly used in plan quality studies. Table I.10 presents the descriptive statistics, including frequencies and measures of central tendency. The modal category for median house value is below $100,000, but the majority of
jurisdictions have a median house value of over $100,000. The median value of houses is $167,120, well above the national average of $119,600. Given that coastal counties include many sites highly valued for their proximity to the ocean and waterways, the high mean value in this sample is not surprising.

### Table I.10: Descriptive Statistics for Median House Value

<table>
<thead>
<tr>
<th>Median House Value</th>
<th>Number of Jurisdictions</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0 to $99,999</td>
<td>80</td>
<td>45.7</td>
</tr>
<tr>
<td>$100,000 to $199,999</td>
<td>63</td>
<td>36.0</td>
</tr>
<tr>
<td>$200,000 or more</td>
<td>32</td>
<td>18.2</td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>167,120</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>165,737</td>
</tr>
<tr>
<td>Minimum</td>
<td>30,400</td>
</tr>
<tr>
<td>Maximum</td>
<td>1,000,001</td>
</tr>
<tr>
<td>n</td>
<td>175</td>
</tr>
</tbody>
</table>

**Number of Disasters:** Previous experience with disasters can increase the salience of mitigation in a community through multiple avenues: by increasing awareness among residents of their vulnerability; by increasing the political importance of reducing losses for elected officials and administrative staff; by tangibly illustrating existing vulnerabilities that were unknown or under-appreciated previously; and by creating a window of opportunity for policy and programmatic changes.

The data source for disaster experience is the Public Entity Risk Institute (PERI) online database of presidentially declared disaster events and the metadata on the date of plan adoption from the DHS-funded study. That database includes the number of presidentially declared disasters for every county by year and type of hazard. The disaster experience variable was measured by calculating the total number of presidentially declared disasters for all hazards for the period ten years prior to the date of plan adoption. Table I.11 shows the distribution to be fairly even on either side of three disasters.

There is the potential for an ecological fallacy in this approach as well because county-level data was applied to municipalities. However, the potential for the ecological fallacy with the PERI data for number of presidentially declared disasters is considered tolerable. The rationale is that
while it is spurious to divide dollar losses or fatalities at the county level between all municipalities in the county equally, as is done with the SHELDUS data, measuring a count of presidentially declared disasters is primarily a measure of disaster awareness. That is, presidentially declared disasters are major disasters that typically capture the attention of broad areas. Thus, if a presidentially declared flood or fire or tornado occurs in one part of a county, it stands to reason that the attention of those who live in unaffected areas of the county will also be captured.

**Table I.11: Descriptive Statistics for Number of Disasters**

<table>
<thead>
<tr>
<th>Number of Disasters</th>
<th>Number of Jurisdictions</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero</td>
<td>14</td>
<td>8.0</td>
</tr>
<tr>
<td>1</td>
<td>27</td>
<td>15.4</td>
</tr>
<tr>
<td>2</td>
<td>24</td>
<td>13.7</td>
</tr>
<tr>
<td>3</td>
<td>41</td>
<td>23.4</td>
</tr>
<tr>
<td>4</td>
<td>23</td>
<td>13.1</td>
</tr>
<tr>
<td>5</td>
<td>23</td>
<td>13.1</td>
</tr>
<tr>
<td>6</td>
<td>7</td>
<td>4.0</td>
</tr>
<tr>
<td>7</td>
<td>3</td>
<td>1.7</td>
</tr>
<tr>
<td>8</td>
<td>9</td>
<td>5.1</td>
</tr>
<tr>
<td>9</td>
<td>3</td>
<td>1.7</td>
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</tr>
<tr>
<td><strong>Mean</strong></td>
<td><strong>3.30</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Standard Deviation</strong></td>
<td><strong>2.21</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Minimum</strong></td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Maximum</strong></td>
<td>10</td>
<td></td>
</tr>
<tr>
<td><strong>n</strong></td>
<td>175</td>
<td></td>
</tr>
</tbody>
</table>

4.5.b.4. **Variables Not Included In Final Analysis:** Each of the variables described above and used in the regression analyses are drawn from previous studies or the conceptual framework guiding this study. Together they cover the key conceptual dimensions of the study, with the exception of stakeholder network structure, which required detailed data collection beyond publically available datasets and was not feasible for the full sample of 175 jurisdictions. Nonetheless, there are other variables that were considered for inclusion in the regression analyses conducted as part of this study. Variables that were considered for inclusion and were tested in preliminary regression models include: plan type, plan date, level of jurisdiction, and whether the plan is an update or not. Because
these variables are not well grounded in the literature and they are not central to the conceptual framework for this study, and alternative model specifications showed their impact was small, they were not included in the regression models used to generate the final results.

4.6 Phase 2 Sample Selection

4.6.a.1: Stage 1 Selection of Jurisdictions in which to Conduct Surveys:

As shown in table I.12, the two preliminary factors limited the potential pool of case counties to seventeen and the number of counties meeting the criterion varies widely across the four states, with none available in Texas.

Table I.12: Counties by State and Plan Adoption Date

<table>
<thead>
<tr>
<th>Adoption Year</th>
<th>Florida</th>
<th>Georgia</th>
<th>North Carolina</th>
<th>Texas</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>2004</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>2005</td>
<td>1</td>
<td>5</td>
<td>0</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>2006</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
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<td>2007</td>
<td>0</td>
<td>1</td>
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<td>1</td>
</tr>
<tr>
<td>2008</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2009</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>2010</td>
<td>1</td>
<td>2</td>
<td>9</td>
<td>0</td>
<td>12</td>
</tr>
</tbody>
</table>

4.6.a.2. Selection of Stakeholders for Web-Based Survey: There are three main ways to identify the boundaries of a network, using 1) a positional approach based on membership criteria (e.g. serving on the official hazard mitigation planning committee); 2) an event-based approach based on an activity (e.g. regular attendance at a hazard mitigation planning committee meeting) and 3) a relational approach based on connections (e.g. sharing information) (Laumann, Marsden and Prensky 1989 in Marsden 1990 and Marsden 2005). Only using a positional, fixed-list of stakeholders compiled by the researcher can result in stakeholders – potentially a large number of stakeholders – being left out of the study, which means the boundary may have been mis-specified (Doreian and Woodard 1992). Kossinets found boundary specification problems may influence network statistics generated from the data (2006).
4.7 Stakeholder Survey Data Collection

4.7.a. Survey Questionnaire Development and Design: A recall approach was taken for two main reasons. First, in cases in which the boundaries of the network are unclear or unknown, such as hazard mitigation planning, bias can be introduced by limiting the range of people respondents can identify (Doreian and Woodard 1992). Recall approaches avoid this problem by not limiting the range of stakeholders available for respondents to choose from to those the researcher has identified. Second, this study is interested in repeated patterns of interaction, such as information sharing, rather than less regular or one-off relationships. Recall approaches tend to expose core contacts, especially when there are enduring and/or long-term, regular interactions (Brewer and Webster 1999, Brewer 2000, Marsden 1990 and Marsden 2005).

The series of follow-up prompts were included because prompting respondents to name additional stakeholders may increase recall as respondents search their memories more thoroughly (Brewer 2000). Research indicates that respondents tend to recall other stakeholders by social clusters, such as faculty members remembering the people in their department by clusters such as other faculty members, administrative staff, doctoral students, and masters students (Marsden 2005). Stimulating respondents by providing social clusters they may use to organize relationships in their minds may be a useful complement to a free recall approach. Considering these points, a series of four prompts were included in the survey after the free-recall question. The prompts asked about these four groups: 1) local government representatives, 2) state and federal government representatives, 3) contractors, academics or other consultants who assisted in plan development and 4) non-profit and private-sector representatives.

Additional design decisions were made to address challenges of generating reliable network data. Respondents were asked to simply identify the existence of a relationship (a binary judgment) rather than asking them to try and identify the strength of the relationships, which is a much more difficult task (Marsden 2005). The questionnaire form was designed to allow respondents to identify up to 21 other stakeholders, rather than limiting them to naming a few number of stakeholders, which
can result in artificially reduced networks (Vehovar, Mandfreda, Koren and Hlebec 2008). Also, the recall question and subsequent prompts appeared after four previous hazard mitigation related questions. This ordering was intended to ‘prime’ the respondents to be thinking about mitigation before trying to answer the network-oriented question because for many of the respondents hazard mitigation is not a daily activity and the priming might help them be more expansive in naming other stakeholders.

4.7.b. Survey Questionnaire Administration: Attempts were made to distinguish between stakeholders who are no longer part of the network (e.g. retired, fired, moved, etc.) and stakeholders who simply chose to exercise their right not to participate in the study. These attempts included asking the person in the stakeholders’ department if they were still in their position and, in some cases, double-checking with the emergency manager leading hazard mitigation about which stakeholders were no longer part of the network. Information about non-respondents were treated as data useful in the analysis of the stakeholder networks because networks with high levels of turnover in the network may be less resilient and effective over time and patterns of non-response among those still in the network may provide insights about types of stakeholders who are less interested in hazard mitigation.

The software used to develop and administer the survey questionnaire was Qualtrics – a commercial, web-based survey software available for use through the Odum Institute for Research in Social Science at University of North Carolina at Chapel Hill researchers.

4.7.b.1. Pre-Testing and Institutional Review Board Approval: In January and February 2011, internal pre-tests of the survey included testing different question formats with other graduate students. Survey paradata, which tracks information about how the survey questionnaire is used (e.g. the amount of time a respondent takes to complete the survey), was also collected. Based on the feedback of the graduate students and the paradata, the main change to the questionnaire was to shorten it considerably. Institutional Review Board (IRB) approval was obtained in March 2011 for an external pre-test.
In late March 2011, the survey questionnaire and administration procedures were pre-tested in Pasco County, FL, Pinellas County, FL, and Carteret County, NC. These three counties were selected for use in the pre-test because they were each part of the sample of seventeen potential counties. Data from the responses and paradata on completion times and indicated the length and number of network-oriented questions was placing too much of a burden on them and leading to low completion rates and insufficient data quality. Thus, the survey was cut from 20 questions down to 10 questions and the network questions were consolidated into a single network question generally framed as sharing of information related to hazard mitigation. After making these changes and receiving another round of approval by IRB, the modified survey questionnaire was pre-tested in Volusia County in April 2011. The response rate and data quality were much improved and the data quality was in line with that desired in the data for the dissertation.\(^1\)

\textit{4.7.b.2. Survey Questionnaire Administration:} The percent of official committee members for whom an email address was obtained in the four case study jurisdictions ranged from 91\% to 100\% in the jurisdictions. Combining committee members and other stakeholders, a total of 161 email addresses were obtained for stakeholders across the four jurisdictions.\(^2\)

\(^1\) An additional modification was made before administering the survey in my main sample counties. Initially, respondents were told that one copy of the text “Hazard Mitigation Planning: Integrating Best Practices in to Planning,” published by the American Planning Association, would be given away to a stakeholder in their jurisdiction through a random drawing. The rationale for using this incentive rather than a more typical drawing for a gift card was that government employees might not be able to accept a gift card because of their government’s administrative rules, but they could accept the book for their professional library and could subsequently share it with other stakeholders in their community.

In the period between March and September 2011, repeated attempts to contact stakeholders whose names had been drawn were unsuccessful. It was taking considerable effort to find anyone willing to accept the books as a free gift. The problems encountered were interpreted as evidence that the book was not serving as a strong incentive for respondents to complete the survey. Thus, the incentive offered was changed from giving one book per community to awarding three $100 gift cards total across all 16 jurisdictions through a random drawing. This change was also approved by IRB. Survey respondents were told in the initial request to complete the survey that they could opt out of the drawing for the gift cards. This opt-out was included because many government officials cannot or choose not to accept anything of value as part of carrying out their job responsibilities. The opt-out was tracked using a question in the survey.

\(^2\) A total of 602 emails were obtained for the 16 jurisdictions, including the four case study jurisdictions.
An introductory email with a link to the survey questionnaire was mailed to the stakeholders on July 12, 2011. Reminder emails asking stakeholders to complete the survey were sent on July 21, 2011 and August 10, 2011. As of August 15, 2011, 57 questionnaires had been completed in the four jurisdictions, enough to be considered useful, an overall response rate of 35%. The response rate in the jurisdictions ranged between 33% and 40%. The next step in the planned survey administration procedure was follow-up phone calls (or in-person visits) to encourage stakeholders to complete the survey.

Follow-up phone calls were made in August, September and October 2011. In Brevard County, Martin County and Onslow County the list of stakeholders only included official committee members, as designated in the plan or identified by the local agency in charge of hazard mitigation planning. Phone calls were made to all stakeholders who had not completed the survey following the email contacts. In New Hanover County, the lists included dozens of stakeholders not on the official committee. Phone calls were made only to members of the official hazard mitigation committee as identified in the plan. This choice was made to keep the sampling consistent across the four counties and to concentrate limited resources on achieving high enough response rates within each county to support generation of network analysis statistics. The phone calls were effective in driving the response rates to a range of 62.5% to 77.8% for the four case and 65.2% overall.

In order to supplement the responses provided by the stakeholders identified in the plans, snowball sampling of stakeholders named by respondents but not included in the original lists gathered from the plans was conducted. The stakeholders named by respondents but not named in the plans consisted of local, state and federal individuals and agencies. The snowball sampling was

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3 For the 16 jurisdictions combined, the overall response rate was 24% and ranged between 6% and 45%.

4 Tracking down the phone numbers for the 455 stakeholders not completing the survey after the email reminders was deemed infeasible and was one of the considerations for focusing on the four case study jurisdictions.

5 The phone calls were used to encourage stakeholders to complete the survey, but they were also used to identify stakeholders no longer involved in the hazard mitigation network. Stakeholders were considered to be out of the network if they were no longer in their position or another position engaged in hazard mitigation planning in their area.
focused on the local officials (including regional officials) rather than the state or federal officials. This decision was made based on an assumption local officials are more likely to have actually been part of network rather than someone who provided reference information. A total of 29 stakeholders were identified through snowball sampling, email addresses were found for 24, and just one completed the survey.\footnote{In Brevard County, the list of local officials to include in the snowball sample was truncated. A respondent from Titusville who is an official committee listed numerous Titusville officials. These were not surveyed because no other municipality named a comparable list of local officials.}

Analysis of non-respondents indicated a mix of county, municipal and non-governmental committee members did not complete the survey. In Brevard County, non-respondents included ten county officials (e.g. Facilities, Schools, and Health departments) eight municipal officials, and five representatives of business, non-governmental and regional government organizations (e.g. representatives from a water management district and a waste management corporation). In Martin County, non-respondents included one municipal official, and three representatives of business, non-governmental and regional government organizations (e.g. an aging organization and local charity). In New Hanover County, non-respondents included eight county officials (e.g. Fire, Public Information and Customer Service departments), one municipal official, and four representatives of business, non-governmental and regional government organizations (e.g. a local hospital and local university). In Onslow County, non-respondents include three municipal officials.

4.7.c. Analysis of Survey Data

4.7.c.2. Analysis of Stakeholder Network Questions: Creating network files from network questions required three main decisions about how to interpret and classify the names provided from the respondents. First, due to the fact that some respondents provided names and organizational affiliations with others only provided organizational affiliations or names, a decision was made to measure connections between stakeholders at the organizational level.\footnote{If the respondent reported a connection to a type of unit of government such that it could not be plausibly assigned to a specific municipality or agency ((e.g. simply ‘cities/municipalities’ or ‘X county’) it was not...} Second, the connections were...
treated as ‘undirected,’ which means if one stakeholder identified another as a source of information the link was treated as reciprocal. This decision was made because the focus of this phase of the dissertation is developing baseline understanding of the connections between stakeholders, rather than tracking flows of information across a network, in which case the direction of the connections would matter much more.

Third, the connections were treated as unweighted. That is, connections between two organizations were measured as either being present (measured 1) or not present (measure 0), regardless of whether or not a respondent named multiple stakeholders in another organization or vice versa. This decision reduces the ability to measure the strength of connections between organizations but was made because the number of stakeholders per organizations included in the survey varied widely within and across jurisdictions.

Visualization of networks from the undirected, unweighted adjacency matrices was conducted using the igraph and statnet packages in the R statistical computing environment (Csardi and Nepusz 2006 and Handcock et al. 2003). The visualization of the networks consisted of plotting the individual organizations as shapes and the connections between them as line. These visualizations provided insights into which types of boundaries are bridged in the networks and the centrality of different organizations. The adjacency matrices for the subset of local planners and emergency managers provided more detailed insights into the degree to which the expertise boundaries were bridged.

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included in the dataset. For example, the Brevard County consultant reported generic connections (e.g. county agency officials, municipal/city agency officials, etc.); since it was not clear which agencies or municipalities he referred to, connections were not assigned for these responses. In contrast, one county emergency services agency respondent in Onslow County reported connections to the “five municipalities within the county.” For this response, connections were assigned to each of the municipal agencies represented on the committee because there are only five municipalities in the county and there is a clear representative of each municipality on the committee. There are two committee members from Jacksonville so the connection was assigned to both. In other cases where a respondent included a response where it was much less clear about which agency in a unit of government might be referred to (e.g. “New Hanover County,” which had four agencies represented on much larger committees) no assignment of connections was made.
Network statistics can be calculated at the individual level and at the whole network level (Wasserman and Faust 1994, Jackson 2008). The individual level network statistics calculated included:

- **Degree** – the total number of links ego has to other stakeholder, which provides a basic measure of how connected a stakeholder (ego) is to other stakeholder.

**Figure I.1: Visualization of Degree Centrality**

- **Betweenness Centrality** – the proportion of shortest paths between other stakeholders in the network that run through ego, which provides a measure of how centrally located in the network a stakeholder (ego) is.
4.8 Semi-Structured Interviews

4.8.a. Selection of Semi-Structured Interview Sample: Stakeholders not captured by the roles or professional specialization criteria, but with unexpectedly central positions in the network, were also included in the sample of stakeholders to be interviewed. An additional consideration was that the primary interest was in the individuals who filled these roles and represented these organizations at the county-level, rather than the municipal level. However, since the dissertation is focused on the integration of local planners into the stakeholder networks, municipal-level planners and zoning administrators, were included as well.
Appendix II

More is Less in Brevard County

1800+ Page Mitigation Plan Heavy on Project Wish Lists,
Light on Land Use

Located on the eastern coast of Florida, pro-growth Brevard County has highly urbanized areas and a unique set of natural resources, both of which are highly vulnerable to hazard impacts because of precarious locations and complex interactions between the built and natural environments. Local stakeholders have used their Local Mitigation Strategy (LMS), which serves as the county’s Disaster Mitigation Act-compliant hazard mitigation plan, to create long wish lists of projects eligible for federal grant funding. The LMS lacks a thorough review and analysis of the interplay of development management and hazard risks, however. Survey responses from twenty five members of the mitigation planning committee, interviews with four key stakeholders,¹ and supporting material from the LMS create a picture of a network of stakeholders engaged in mitigation planning that is hierarchically structured, inactive, and involves few local planners. As this case study will demonstrate, state and federal approaches to implementing the federal disaster mitigation policy framework have coupled with attributes of the stakeholder network to lead Brevard County to develop an LMS that is 1) highly fragmented and cumbersome to read, yet technically compliant with mandates and 2) so narrowly project-oriented that unless federal funding is available in a timely manner interest and participation in local mitigation planning wanes. Implementation of mitigation actions is limited in general and specifically when it comes to land use-oriented approaches.

This chapter consists of a brief description of the case setting (section II.1), followed by a summary of two types of hazard mitigation planning outputs: the incorporation of land use

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¹ The four stakeholders interviewed included two county emergency management officials, a county natural resource official, and a municipal utilities official. See Chapter 4 for more detail on the selection process and interviewing procedures.
approaches into the hazard mitigation plan (II.2) and ongoing implementation of land use approaches to mitigation (II.3). It then reviews the influence of four aspects of local mitigation planning on mitigation planning outputs: the planning process used to develop the plan (II.4) the network diversity (II.5), the network structure (II.6), and bridging the expertise boundary between emergency managers and planners (II.7). The interplay of local community characteristics and the state policy context with the planning process and network-oriented characteristics are addressed throughout. The chapter concludes with a summary of the key findings from the case (II.8).

II.1. Case Setting

Brevard County is located on the east coast of Florida and in 2000 its population was 476,230 (Census 2000). Development is concentrated in sixteen cities and towns in the eastern part of the county, including Palm Bay (population 79,413 in 2000), Titusville (population 40,670 in 2000) and Cocoa Beach (population 12,482 in 2000). Population grew 14.1% between 2000 and 2010 and population density was 534 people per square mile in 2010 (Census 2000 and 2010). Brevard County’s socio-economic profile is somewhat below the national averages for median home values, poverty rates, and proportions of highly educated adults (see Table VI.1 in Appendix VI). Recently the county’s economic pillars of development, the space industry and tourism have struggled. The county is environmentally unique because it is on the eco-tone boundary between temperate America and subtropical Caribbean and the Indian River Lagoon is the most diverse estuary in the United States.

High winds and storm surge accompanying coastal storms and flooding pose the greatest threats to eastern Florida. In 2004 Brevard County was directly hit by Hurricanes Charley, Frances, and Jeanne, which together caused more than $500 million in damages and led to Presidential Disaster Declarations for each (Brevard County Local Hazard Mitigation Plan 2009). Since the late 1990s, there have been five additional Presidential Disaster Declarations including a severe freeze event in 2001, Hurricane Ivan in 2004, Hurricane Wilma in 2005, Tropical Storm Fay in 2008, and the Mother’s Day Fires in 2008. Sixty percent of the county’s land area is in the 100-year floodplain
and the county has 64 identified repetitive loss properties, nine of which have estimated losses in excess of $100,000, including one at $998,520 and one at $1,624,470 (BCLHMP 2009). Roughly 20% of the county’s population, 96,164 residents, live in areas at risk of storm surge, and the number at risk is likely to increase since 73% of the undeveloped land in coastal hazard or hurricane vulnerability areas is designated for future residential development (BCLHMP 2009). These socio-economic, environmental and climatic attributes make Brevard County’s human and natural resources highly vulnerable to a wide range of disturbances, which in turns makes mitigation planning a critical local task.

II.2. Planning Outputs: Hazard Mitigation Plan Quality

Brevard County’s current Local Mitigation Strategy (LMS), which serves as its Disaster Mitigation Act-compliant plan, was adopted in 2010. The LMS is a massive, 1,822-page document developed using the consultant erp&m’s (Emergency Response Planning & Management) proprietary Mitigation 20/20 software. Most of the plan material falls into two categories: 1) generic language with little customization to the unique characteristics of Brevard County and 2) dozens of spreadsheet-like ‘reports’ that summarize qualitative and quantitative data, which is often duplicated across reports. Individual Jurisdiction Plans, one for each of the sixteen participating jurisdictions, make up 1,150 pages of the plan. Instead of a master table with all of the information about each of the actions proposed in the plan (e.g. cost-to-benefit ratio, potential funding sources, hazard addresses), that information is spread across more than half a dozen reports over 200-plus pages of the plan. Overall, the plan is highly detailed, but also highly fragmented, extremely repetitive, graphically weak, as shown in the poor map quality in Figure II.1, and cumbersome to navigate. Based on its length and lack of readability, it appears the plan was crafted with an audience in mind of only state and federal plan reviewers using a set of specific criteria to evaluate the plan.

While the fragmentation of the plan makes it a challenge to thoroughly and systematically analyze, the clear conclusion is that the Brevard County LMS integrates land use approaches in a superficial manner. In laying out the purposes of the plan in its introductory section, the LMS
references the important role of land use in mitigating hazards. Multiple objectives in the goals section of the plan directly relate to land use. Yet, as evidenced in the fact base, policies, and implementation principles of the plan, land use approaches are not presented as a core component of the county’s past or future approaches to mitigation. The capability assessment (i.e. fact base principle of plan quality) includes excerpts of exact language of land use related policies from existing ordinances and plans for each jurisdiction, but does not provide any contextual information or a synthetic summary of how the polices form a coherent development management program or reduce hazard risks. Land use-oriented approaches to mitigation are largely absent from the proposed actions (i.e. policies principle of plan quality) in favor of project-oriented approaches. The plan provides extensive implementation-related information (i.e. implementation principle of plan quality) for each of the project-oriented actions included in LMS, but little information about how the mitigation plan will be incorporated into other planning initiatives.

II.2.a. Fact Base Principle: Capability Assessment

Elements of a capability assessment, including land use related capabilities, are scattered and repeated throughout the LMS, leaving the reader with at best a murky view of Brevard County’s capacity to undertake hazard mitigation efforts. The main body of the plan includes brief and general narrative descriptions of the types of policies being used in the participating jurisdictions. A report appended to the vulnerability assessment quotes relevant policies for each jurisdiction drawn from sources such as a jurisdiction’s code of ordinances, comprehensive plan, building codes, land development code, and capital improvement plan. Not only is this material spread across multiple sections of the plan, it is not summarized in a clear narrative to provide a picture of the overall capability of the jurisdictions in the county and gaps in the current capability.

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2 Also included are tables showing the number of policies each jurisdiction has in different mitigation categories (e.g. for flooding, policies related to dunes, wetlands, building codes, avoidance, drainage and mobile homes).
Figure II.1: Map of Brevard County Showing Storm Surge Zones (BCLMS 2010, page 258)
Additionally, the plan notes that the capability assessment was not updated for the 2010 plan: “[t]hese mitigation-related policies were discussed in the previous versions of the plan and, due to the lack of changes in those policies in the interim, this information has not been modified from the previous update of the local mitigation plan” (BCLHMP 2010, page 171). Thus, according to the plan none of the jurisdictions made any changes to its code of ordinances or related plans that might affect mitigation efforts between 2005 and 2010.

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Meanwhile, each of the sixteen Individual Jurisdiction Plans repeats the identical three-paragraph narrative on mitigation policies and plans, with minor adjustments made for each

\(^3\) Also included are tables showing the number of policies each jurisdiction has in different mitigation categories (e.g. for flooding, policies related to dunes, wetlands, building codes, avoidance, drainage and mobile homes).
jurisdiction (e.g. changing the CRS rating level or the number of mitigation-related policies included in the report). The Individual Jurisdiction Plans also include reports quoting relevant policies from the code of ordinances, comprehensive plans, and other sources (Figure II.2). Contextual information about the policies from the ordinances or plans is lacking, however. For example, the plan does not reference the year of adoption of the comprehensive plan from which the language is excerpted nor does it make clear the purpose of the comprehensive plan or how it relates to the hazard mitigation plan. Further muddling the picture of existing capabilities is the fact that these jurisdiction-specific reports simply duplicate the information in the report appended to the vulnerability assessment.

In spite of the shortcomings of the approach to conducting a capability assessment used for each jurisdiction in the LMS, the Individual Jurisdiction Plan for unincorporated areas of Brevard County does identify a number of existing land use oriented policies contained in the code of ordinances and the comprehensive plan. These include considering hurricane evacuation capacities when setting residential densities; the county not investing in new transportation corridors, water, sewer lines or other public facilities (other than recreation) in Coastal High Hazard Areas; the county developing a post-disaster redevelopment plan that limits density; and not increasing residential densities in Coastal High Hazard Areas. The comprehensive plan language also includes “develop plan for long-term response to sea level rise” (BCLHMP 2010, page 516). These policies suggest the county utilizes a number of land use approaches to mitigation and is engaging with climate change adaptation issues. Yet, the lack of a synthesis of how the policies form an overall development management strategy and whether that development management strategy reduces hazard risks precludes identifying gaps in existing policies and other capabilities.

An additional point related to the capability assessment is the total lack of land use and zoning maps in the LMS. By default there are no maps overlaying hazardous areas and zoning or
hazardous areas and existing or future land use patterns. Instead, reports and tables for municipalities and the unincorporated areas of the counties include basic summary tables showing the area in current and future land uses. These tables lack spatial specificity.

Figure II.2: Excerpt of Brevard County Code of Ordinances Included in LMS (BCLMS 2010)

<table>
<thead>
<tr>
<th>Citation</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>II.62.1255.2</td>
<td>Residential density should consider hurricane evacuation capabilities.***(c)In all areas of the City, the production, storage, use or disposal of identified hazardous and toxic materials shall be restricted as set forth in Sections 35-103 and 35-106, below.</td>
</tr>
<tr>
<td>II.62.2891.a</td>
<td>House pads or lot elevations in the A or AE flood zones consistent w/ FEMA***(8)On-site waste disposal systems shall be located and constructed to avoid impairment to them or contamination from them during flooding; and</td>
</tr>
<tr>
<td>II.62.3631.d</td>
<td>Located within an area of special flood hazard shall file an evacuation plan***To protect the health, safety and welfare of the citizens of Titusville, hazardous and toxic materials shall be limited as follows:</td>
</tr>
<tr>
<td>II.62.3695.e</td>
<td>Structures are floodproofed and located above the 100-year flood elevation.&quot;**(9)Any alteration, repair, reconstruction or improvement to a structure which is in compliance with the provisions of this article shall meet the requirements of &quot;new construction&quot; as contained in this article.</td>
</tr>
<tr>
<td>II.62.3723.1</td>
<td>Floodplain uses include agriculture, recreation, wildlife and open space.&quot;**(a)In all areas of special flood hazard the following provisions are required:</td>
</tr>
<tr>
<td>II.62.3724.b</td>
<td>Dev in the 10-25 yr floodplain shall not result in loss of flood storage.&quot;**(10)Any persons wishing to develop within the one hundred-year flood zone shall provide compensatory storage in an amount equal to the volume of fill which is placed within the flood zone which is above the existing ground elevation and below the one hundred-year flood elevation. Credit for compensatory storage will only be given for that volume of storage which is above the normal high groundwater table elevation and below the one hundred-year flood elevation; or the developer must provide site specific data to the satisfaction of the City that the proposed development will not raise the base flood elevation on adjacent or downstream properties. These data are to be derived from technical information which is to be submitted for review and approval by the City. Determination of the applicability of this provision shall be made by the City engineer subject to appeal to the Board of Adjustments and Appeals.</td>
</tr>
<tr>
<td>II.62.3724.c</td>
<td>Dev in the 10yr floodplain shall not result in any loss of flood storage.&quot;** (a)In all areas of special flood hazard where base flood elevation data have been provided, the following provisions are required.</td>
</tr>
<tr>
<td>II.62.3725.a</td>
<td>New structures shall not be permitted below the riverine 100-yr flood elev&quot;**(1)Residential Construction. New construction of [or substantial</td>
</tr>
</tbody>
</table>

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4 The plan does include four countywide maps of hazard zones, one each for floods, storm surge, wildfire, and beach erosion. None of the maps contains land use information and the legends are unreadable for the flood and storm surge maps (see Figure 9.2 for an example).
Taken as a whole, the extensive data compiled in the capability assessment-related reports does a poor job of communicating vital information needed to understand existing capabilities to reduce hazard risk and gaps in those capabilities that need to be filled through policy change and projects. These shortcomings result in a weak foundation for crafting an effective mitigation strategy.

II.2.b. Policies Principle: Mitigation Strategy

The mitigation strategy of the LMS, which includes the future-oriented actions associated with the policies principle of plan quality, includes very few land use-related actions and instead focuses on project-oriented approaches. More than 775 actions have been proposed by steering committee organizations since the 1999 plan was developed and the LMS indicates 218 of those have been completed to date.\(^5\) As one stakeholder noted, “we have a tendency to load the LMS up with every dream project we’ve ever wanted to do.” This dynamic is driven in part by the “need to be on the LMS list if you want those projects funded,” which points directly to the influence of the top-down, project-oriented approaches of the State of Florida. Quantitative rankings were used by the Brevard Prepares steering committee to systematically prioritize the proposed actions so when federal grant funds become available decisions can be made about grant applications quickly and equitably. Projects “sit there until money is available,” as an emergency management official said. When money comes available, emergency management officials “generally have each municipality pick one project that they would like to have funded and try to get one in the priority list.”

The overwhelming majority of the proposed actions in the LMS are related to emergency services (e.g. buying generators and updating communications), property protection (e.g. shuttering

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\(^5\) The plan notes 15 completed county-level actions, including purchasing a generator (x4), purchasing emergency radios, installing hurricane shutters on a building (x2), installing a mobile communications tower, rebuilding fire stations, providing fire well/pump improvements, paying firefighter overtime, relocating a fire supply unit, purchasing ambulatory bus, developing a weather watch video, and replacing an outfall pipe.

\(^6\) The plan also includes a report on the effectiveness of existing mitigation measures. It assigns estimated percent of damage reduction and estimated damage costs to completed projects. It estimates projects have avoided more than $5 billion in costs between Hurricanes Charlie, Frances, Jeanne, and Tropical Storm Fay. An example of questionable cost saving estimates includes $1.75 billion saved by developing Cocoa Beach’s Stormwater Master Plan.
public facilities) and structural controls (e.g. drainage projects). At the county-level there are no land
use-related policies included for future action, although there are a few properties targeted for
acquisition. A few municipal actions are land use-related, such as Satellite Beach’s proposal to
update its land development regulations, but these are a very small minority of the projects on the
LMS list. The impact of the lack of emphasis from the State of Florida placed on including policy-
oriented land use approaches alongside grant-eligible projects is evident in the range of actions
proposed in LMS mitigation strategies.

II.2.c. Implementation Principle: Implementation Information

Information in the LMS about how Brevard Prepares stakeholders will implement specific
project-oriented actions is very detailed, though also very fragmented. Implementation information
about land use approaches is, for all intents and purposes, non-existent. For the county-level projects,
numerous pieces of implementation-related information are provided. This information is spread
across nearly a dozen tables making it extremely difficult to gain a clear view of the project and how
it will be completed if funding becomes available.

The LMS provides very little information about how the mitigation plan will be integrated
with other planning efforts. A general statement indicates that mitigation stakeholders will continue
to improve existing policies, plans and programs, including comprehensive planning and related land
use planning. For the county, the proposed modifications to existing policies, plans and programs
focus on a drainage study and a post-disaster building code update. Meanwhile, incorporation of the
LMS into other planning initiatives is dealt with in two short paragraphs, which note that other plans
exist, make general statements that the plans benefit from their mutual existence, and indicate that
“wherever appropriate, [efforts to incorporate mitigation] will be given emphasis in each planning
cycle” (BCLHMP 2010, page 397).

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7 These include the sponsoring agency, priority score, benefit-cost ratio, current implementation status,
estimated cost, potential funding sources, estimated completion date, and relevant goals and objectives.
II.3. Planning Outputs: Implementation of Land Use Approaches to Mitigation

Given the lack of land use approaches in the LMS, it is not surprising that interviews with key stakeholders point to very little implementation of land use approaches to mitigation in Brevard County. First, there were no actions on the Brevard County list that were primarily land use-oriented. Second, emergency management officials indicated there are no mitigation projects – land use related or not – they are actively working on because there is not any funding available. Third, stakeholders’ described past implementation efforts as focusing on retrofitting homes, maintaining and improving evacuation routes, dealing with drainage issues to reduce flooding, avoiding the placement of shelters on barrier islands, and removing invasive tree species highly susceptible to windfall – none of which deal with core land use issues. The county Natural Resources department has engaged in two mitigation efforts with strong land use connections, but both have failed to make substantial progress to date.8

A theme about implementation of mitigation actions heard from the stakeholders was the myriad challenges dealing with FEMA in the post-disaster grant application process. Challenges included FEMA staff with little familiarity with mitigation, frequent FEMA staff turnover, inconsistent feedback on applications and eligibility due to FEMA staff turnover, difficulties obtaining reimbursements for work completed in a timely manner or at all, and illogical program parameters related to federal bureaucratic divisions.9 Frustrations resulting from these challenges have led some municipalities to implement their proposed actions little by little using local funds or other non-FEMA grant programs.

8 The county aims to acquire beachfront properties, demolish the structures and use the land for natural mitigation in the lower-density southern part of the county but efforts to establish a local funding source have not been successful. Also, a climate change adaptation initiative was started with intentions to coordinate it with comprehensive planning, but work on it is currently dormant due the local political climate become less favorable.

9 For example, one interviewee described cleaning debris on one stretch of a local road requiring multiple different work orders and federal forms because some segments of the road are covered by a FEMA program and others are covered by Federal Highway Administration program.
Finally, responses from Brevard Prepares steering committee members about use of generic land use approaches in their ongoing work in 2011—not limited to LMS-related efforts—indicate that some stakeholders are using land use approaches in their municipalities and organizations (Table II.1). While these responses are not directly tied to implementation of the LMS, they do suggest that there are land use-related mitigation efforts happening in the county. What they also suggest is that Brevard County is missing an important opportunities to thoroughly integrate these efforts into its LMS.

**Table II.1. Committee Members’ Self-Reported Efforts to Implement Land Use Actions**

<table>
<thead>
<tr>
<th>Land Use Action Type</th>
<th>Percent of Committee Members Reporting Effort (Number reporting/total respondents)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limit development in hazardous areas</td>
<td>41% (9/22)</td>
</tr>
<tr>
<td>Setbacks, buffers and regulations to protect natural mitigation features</td>
<td>35% (8/23)</td>
</tr>
<tr>
<td>Elevating or Acquiring Properties</td>
<td>14% (3/22)</td>
</tr>
<tr>
<td>Acquire land to protect natural mitigation features</td>
<td>27% (6/22)</td>
</tr>
<tr>
<td>Incorporate hazard mitigation plan into other planning initiatives</td>
<td>57% (13/23)</td>
</tr>
<tr>
<td>Land use modeling and/or analysis</td>
<td>36% (8/22)</td>
</tr>
</tbody>
</table>

**II.4. Local Mitigation Strategy Development and Update Process**

Limited integration of land use into the LMS and the lack of readability of the plan appear to have been heavily influenced by the cursory involvement of local stakeholders in the plan’s development. The consultant-driven process focused on compiling data as opposed to fostering dialogue about underlying vulnerabilities and collaboration to develop a proactive strategy to reduce hazard risks.
Brevard Prepares, a coalition of mitigation stakeholders led by county emergency managers, partnered with a private emergency management consultant, erp&m, to develop and update Brevard County’s Local Mitigation Strategy (LMS). Brevard Prepares consisted of a steering committee and support staff. The steering committee’s role was “to coordinate and approve proposed mitigation initiatives for incorporation into the plan, for determining priorities for implementation of those initiatives, and for removing or terminating initiatives that are no longer desirable for implementation” (BCLHMP 2010, p. 12). The Brevard County Office of Emergency was responsible for coordinating and staffing Brevard Prepares. More than 50 governmental, private business, and not-profit organizations were members. Notably, Brevard County Planning and Zoning was not a member, but the county Natural Resources department was and two municipal departments related to land use planning were (i.e. community development and land development.) Thirty pages of bylaws and operating procedures for Brevard Prepares are included in the LMS, suggesting that relationships between the stakeholders and the process of developing, updating and maintain the LMS are quite formalized.

The private consulting firm, erp&m, facilitated and managed both the 2005 and 2010 update processes required by the DMA. The process for updating the LMS in 2009 and 2010 was driven by the use of erp&m’s Mitigation 20/20 software, with little interaction among steering committee members or public involvement. Referring to erpm, an emergency management official indicated that “[t]hey pretty much did the entire project … [t]here’s no way one of us could’ve been able to do that in this office in the amount of time we had to do it because of our other job duties.”

After a kickoff meeting of the Brevard Prepares steering committee on August 31 2009, erp&m held individual technical assistance meetings with representatives from each of the participating jurisdictions to revise jurisdiction-specific components of LMS in September. Then, erp&m took the data collected from the stakeholders and entered it into the Mitigation 20/20 software

\[10\] The erp&m consultant who completed the survey reported emergency management as his professional background and training.
to generate reports to be included in the mitigation plan, such as records of public meetings and lists of proposed mitigation activities. erp&m was responsible for updating the entire document.

Participation of Brevard Prepares steering committee members in the update process tended to be infrequent.\textsuperscript{11,12} Altogether, the LMS planning process offered few opportunities for stakeholders to come together and grapple with difficult problems related to how choices made about land use, infrastructure investments, and managing natural resources contribute to current and future hazard vulnerabilities.

\section*{II.5. Hazard Mitigation Stakeholder Network Diversity}

Surveys of twenty-five of thirty-nine LMS steering committee members from the 2009 planning process who are still in the mitigation network (see Chapter 4 for more information on survey methodology) enabled further exploration of the relationship between the diversity of stakeholders in the mitigation network, including the assets they brought to the planning process, and mitigation planning outputs. This analysis indicates that a diverse array of groups engaged in mitigation planning, but there was very limited involvement of planning-oriented stakeholders trained to foster and facilitate dialogue about land use choices. Among steering committee survey respondents, five described their professional expertise as emergency management and/or fire, four indicated engineering, four public administration, and many other professional specializations were.

\textsuperscript{11} In response to the survey conducted for this dissertation, two members indicated participating a few times a week, eight indicated participating a few times a month to once a month, and fourteen reported participating less than once a month or never.

\textsuperscript{12} Once fully drafted by erp&m the LMS was posted online and public notices were made asking for public comments during December 2009 and January 2010. No comments were received. One stakeholder noted, we “did not get one citizen in this county to a meeting … but they do get very interested when their neighborhood floods.”

In contrast to the limited public involvement in the plan update process, one of the reports in the plan documents more than 100 public outreach meetings held by Brevard Prepares organizations between 2005 and 2009. Most of the meetings focused on educating the public about hurricane preparedness; the report notes that the meetings reached as few as three attendees to more than one hundred attendees. Meetings were held with a very wide range of stakeholders, such as chambers of commerce, homeowners associations, and educational institutions. Emergency management officials echoed this finding “public outreach is all the time … we always talk about doing mitigation when we do our hurricane preparedness talks to the public.”

Following state and FEMA review of the draft, a public meeting was held in June 2010 to allow the public to make comments on the final draft.
reported as well. Yet, none of the twenty-five respondents indicated professional training in land use planning.\textsuperscript{13}

The lack of planner involvement likely explains multiple shortcomings in the plan, starting with the presence of little more than disjointed lists of technically worded policies in the capability assessment sections of the fact base. Local planners typically have the type of training and expertise needed to develop a clear and cogent summary of how existing policies inter-relate and form a cohesive development management program, and, by extension, whether that program is effective in reducing hazard risk. Lack of planner involvement may also explain why the 2010 version of the plan does not provide up-to-date and detailed information about land use related capabilities. In terms of vague information about how the LMS will be integrated with other planning efforts, limited involvement of planners is a plausible explanation because maintaining familiarity with multiple ongoing planning initiatives (e.g. housing, transportation, land use, etc.) is a key part of local planners’ daily work. Without such familiarity it is difficult, if not impossible, to devise and implement a strategy for integrating plans so that they are a mutually reinforcing web of policy documents rather than isolated stovepipes with unrelated project proposals.

Beyond professional specializations and expertise, there are specific stakeholder assets that can contribute to plan making in general and to incorporating land use in mitigation planning in particular. In terms of individual members’ experience with hazard mitigation, twelve of the twenty-four respondents reported more than 10 years of experience and four reported having between 6 and 10 years experience. In terms of skills related to developing a plan, twenty committee members indicated skills in outreach and communications and sixteen indicated skills in facilitation, mediation and conflict resolution. Considering the consultant-driven process, however, it appears these assets were leveraged to a limited degree to improve the quality of the plan.

\textsuperscript{13} Interviews with stakeholders corroborate these findings, though it did become apparent that a few of the peripheral stakeholders have land use planning backgrounds.
When it comes to land use related assets, it also appears that the committee member’s skills were not leveraged in the planning process. Seven committee members indicated analytical technical skills, such as GIS and HAZUS. Yet, the apparent failure of the consultant-driven process to leverage local skills can be linked to lack of detailed and systematic analysis of the relationship between land use and hazard vulnerability and the poor quality maps in the plan. Skills related to ongoing plan implementation were limited as well, with fourteen committee members indicating skills in regulation drafting/interpretation, eleven indicating skills in plan and/or site review, and four indicating executive or legislative rule making authority. Six committee members indicated authority to distribute funds for mitigation projects and six indicated executive or legislative authority for budgeting. Along with the approach for crafting the plan taken by the consultant, the state’s prioritization of project-oriented mitigation also explains why these skills do not appear to have led to more integration of land use in the plan.

Another important asset for integrating land use approaches into mitigation is favorable views among stakeholders about the effectiveness of preventative land use approaches to mitigation. As seen in Table IV.2, Brevard County stakeholders indicated favorable views of preventative land use approaches and related natural resource protection approaches (e.g. wetland conservation). Project-oriented approaches (i.e. property protection, emergency services, and structural controls) receive more or less equivalent ratings.

**Table II.2 Brevard County Stakeholder Views on Effectiveness of Mitigation Approaches**

<table>
<thead>
<tr>
<th>Mitigation Approach</th>
<th>Mean Score *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property Protection</td>
<td>4.0</td>
</tr>
<tr>
<td>Information</td>
<td>3.6</td>
</tr>
<tr>
<td>Preventative Land Use</td>
<td>4.1</td>
</tr>
<tr>
<td>Emergency Services</td>
<td>4.1</td>
</tr>
<tr>
<td>Structural Controls</td>
<td>3.9</td>
</tr>
<tr>
<td>Natural Resource Protection</td>
<td>4.2</td>
</tr>
</tbody>
</table>

n =22

* 5.0 Very effective to 1.0 Very Ineffective
II.6. Hazard Mitigation Stakeholder Network Structure

Looking more closely at the mitigation stakeholder network to examine the patterns of relationships between stakeholders provides additional explanations of the focus on project-oriented approaches to mitigation rather than land use approaches in the plan. Overall, the Brevard County mitigation stakeholder network was relatively large, sporadically active, and hierarchically structured. It had a small core dominated by county, state, and federal emergency management agencies surrounded by layers of increasingly peripheral stakeholders. In the context of the consultant-led planning process and limited planner involvement, the network characteristics appear to have limited opportunities to leverage the assets of the stakeholders to foster integration of land use into the plan.

First, the network of stakeholders sharing information in recent years is relatively large, with 71 organizations total in the network, of which 38 were members of the Brevard Prepares organization (see Figure II.3).\textsuperscript{14} Stakeholders indicated that the network was very active in post-disaster situations when funding was available, but otherwise has been inactive, meeting annually in line with LMS program requirements and, as an emergency management official said: “unless we are meeting we don’t really have any regular contact because … there’s no funding for it.” The network appears to have been fairly stable over the last few years.\textsuperscript{15}

By all measures, Brevard County Emergency Management (the triangle labeled “A” in the center of the network in Figure II.3) was the central stakeholder in the information-sharing network. It had the highest degree centrality, with 23 connections to other stakeholders (32\% of all the

\textsuperscript{14} Fourteen of the seventy-one organizations are not shown on the figure because they are isolates; that is, they are stakeholders with no connections to other stakeholders reported by either the isolate or the other organizations in the network.

\textsuperscript{15} 81\% of the Brevard Prepares members still working at the organizations they represented in the plan development process in late 2011. A current list of Brevard Prepares members was obtained from the Brevard County Office of Emergency Management. Nine of forty-eight members of Brevard Prepares are no longer part of the network (e.g. retired, in a new position, or indicated they did not work on mitigation).
stakeholders), and the highest betweenness centrality. Interviewees confirmed the key coordination role played by the two county Emergency Management agency staff. The Emergency Management director, who died the day before he was to be interviewed for this dissertation, was extremely well connected and well regarded throughout the county, the state, and beyond. One of his staff, the Brevard Prepares coordinator, handled communication with stakeholders, served as the liaison to the consultants from erp&m, and helped municipalities connect with FEMA and complete grant-applications following disasters. This coordinator wore many other hats in the agency as well, including managing budget and finance, grants, the special needs program, and health care reviews for facilities such as assisted living facilities.

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16 The degree centrality of the Emergency Management department was 23 (i.e. connections to twenty-three other stakeholder organizations), while the next closest degree centrality was 11. Its betweenness centrality score was 949, which is difficult to interpret in isolation; the next closest score was 404.

17 This mitigation coordinator and the interim Emergency Management director were interviewed a few weeks after the death of the director.
Figure II.3: Brevard County Information Sharing Network

Organization Expertise Type
- ▲ Emergency Management
- ◆ Planning
- ● Other Expertise
The Florida Division of Emergency Management (in Figure II.3 the triangle just to the upper right of county Emergency Management labeled “B”) and FEMA (the triangle to the lower left of county Emergency Management labeled “C”) were also both very central to the network in terms of total connections and betweenness centrality. Central positions for these agencies fit with descriptions by interviewees of extensive interactions with federal and state emergency management staff in the process of preparing, reviewing and approving local post-disaster mitigation grants opportunities. Non-emergency management stakeholders interviewed described their positions as peripheral to the network. Also, as shown by the diamonds in Figure IV.3, all of the land use planning-oriented stakeholders were peripheral to the network, with one or more bridging stakeholders between them and the core of the network. Finally, the consultant (represented by the circle labeled “D” at the bottom of the network) was reported as a source of mitigation information by just one stakeholder, which is interesting because the consultant met with most or all of the Brevard Prepares steering committee members. A possible explanation for the surprisingly peripheral position of the consulting firm is that the steering committee members viewed the consultants as filling a purely data consolidation and processing role, rather than being a source of information.

The network exhibited a ‘hierarchical’ structure with a central core of stakeholders linked to layers of peripheral stakeholders. Most of the outermost peripheral stakeholders were not on the Brevard Prepares steering committee, and the stakeholders who linked the peripheral stakeholders to the core of the network filled key bridging roles. The peripheral fans fell into two categories: municipal-based fans consisting solely of stakeholders from the same municipality and discipline-based fans consisting solely of stakeholders working in the same professional discipline (e.g. transportation or water management). A municipal based fan is shown on the right side of the figure where the fan of eight organizations consists of Titusville agencies (seven circles and one triangle), which were connected to the core of the network through the Titusville Special Projects official. At

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18 Peripheral stakeholders were sent the web-based survey as part of the snowball sample (see Chapter 4), but most did not complete the survey. It is possible that these peripheral stakeholders have additional connections not captured in the figure above.
the top of Figure II.3 is a discipline-based fan. The five stakeholders were transportation stakeholders linked to the core of the network through the Space Coast Transit Agency. The inter-twined fans to the left of the core consisted of a variety of water management organizations and were linked to the core by the county floodplain manager and the stormwater manager.

High betweenness centrality scores for the bridging stakeholders indicate their important roles in consolidating information from their municipal or disciplinary partners and then communicating that information to the county Emergency Management officials who would otherwise not have access to those stakeholders. Brevard County’s high number of municipalities and overall large population may explain this hierarchical structure because it allows each municipal or disciplinary domain to independently and efficiently work together and then coordinate their efforts through a single stakeholder at the Brevard Prepares table.

In line with the descriptions in the LMS of Brevard Prepares’ broad and formalized membership, the hierarchical network described here provided a well-ordered structure for efficiently consolidating information from (and distributing information to) the large number of stakeholders spread across many municipalities and other organizations. The county emergency management agency was in a position to be the opinion leader and power broker in the network, especially when complemented by the state and federal mitigation agencies. The formal by-laws and rules for Brevard Prepares reinforced this network structure and gave its members clarity about their relative rights and responsibilities.

Stakeholders interviewed made a point of emphasizing that while the network of stakeholders working on mitigation was largely inactive with infrequent contacts related to hazard mitigation efforts between stakeholders, many of the same stakeholders had much stronger ties and more frequent contact around emergency preparedness and response efforts. They indicated that when the Emergency Operations Center was activated for events such as Hurricanes Charlie, Frances and Jeanne in the mid-2000s, stakeholders worked together hour after hour, day after day, building strong connections in the disaster response process. More recently, these connections were activated quickly
in a preparedness function when it appeared that the gulf coast oil spill in 2010 might get caught up in the gulfstream and impact the eastern coast of Florida, including Brevard County. Thus, the lack of a strong and active mitigation network is not necessarily an indication of an overall weakness of ties between key stakeholders, but points to limited activation of complementary connections for mitigation purposes except when post-disaster mitigation funding was available.

II.7 Bridging the Emergency Management – Land Use Planning Expertise Boundary

Clearly, the LMS document, survey responses, and interview responses point to limited bridging of the emergency management – land use planning expertise boundary in mitigation efforts in Brevard County. County planners were not included on the Brevard Prepares steering committee and the two land use planning-oriented stakeholders on the steering committee were municipal representatives (i.e. Titusville Planning in the Titusville fan to the right of the core labeled “E” and Palm Bay Land Development to the lower right of the core labeled “F” in Figure II.3). The information-sharing network shows essentially the same pattern for each of the land use planning stakeholders; namely, they were located on the periphery of the network. Two planning stakeholders not on the steering committee – Brevard County Planning and Zoning department (labeled “G”) and the East Central Florida Regional Planning Council (labeled “H”) – were connected to the core of the network only through the Brevard County Fire Rescue department. Thus, there were no direct links between the county emergency management agency and planning organizations in the information-sharing network as reported by the stakeholder survey responses.

In a slight deviation from the survey-generated connections just described Brevard County emergency management officials did say in interviews that the Brevard County Planning and Zoning officials helped with the development of the current LMS and provided information to the consultant. Yet, they also pointed out that the county Planning and Zoning department had undergone huge cuts to staffing in recent years due to limited funding. The result is a “skeleton crew” with no capacity to take on mitigation-related responsibilities. Notably, an emergency management official felt that the “LMS and mitigation planning should actually be in the Planning Department because they’re the
ones who really have … a strong hold on what is being developed in the county.” This argument includes explicit recognition of the tight linkage between land use and hazard vulnerability. It also represents an implicit understanding that emergency managers, at least alone, do not have a clear understanding of the land use variables that factor into the hazard mitigation equation. Ironically, in Brevard County – a highly urbanized, pro-growth county where emergency management officials see a critical role for local planners – local capacity for planner involvement is insufficient and state and federal approaches do little to foster greater linkages between emergency managers and local planners.

II.8 Summary

Over the last 10 years, a hierarchically structured network of mitigation stakeholders in Brevard County has worked with an emergency management consultant on updating the county’s Local Mitigation Strategy (LMS) in order to maintain compliance with state and federal requirements. The network has included limited involvement of local planners, whose own capacity has decreased dramatically recently. Meanwhile, local emergency managers have limited internal capacity to conduct mitigation planning. Overall, the LMS document is very fragmented, extremely cumbersome to read, and focuses on developing wish lists of discrete projects for each stakeholder. The combined wish lists of all stakeholders are prioritized and balanced so that the county’s federal disaster funds are split fairly and equitably between stakeholders when they are allocated after a hazard event. Incorporation of land use into the LMS is limited throughout and is essentially absent in the future-oriented policies and implementation parts of the plan. Participation in the LMS program in Brevard County has been relatively low because of limited funding at the local level in general and for mitigation efforts in particular. Extensive challenges in successfully navigating the FEMA post-disaster grant review process have resulted in considerable frustration among local stakeholders.

This case study points to the strong influence of state and federal implementation of local mandates on the network of local stakeholders and their joint influence on hazard mitigation planning outputs. The emergency management-driven, project-oriented approach fostered by the State of
Florida and FEMA is reflected in the hierarchical structure of the stakeholder network with peripheral fans feeding into a core of emergency management-oriented stakeholders. When coupled with formalized by-laws and rules, this structure provides clarity and equity in prioritizing each stakeholder’s wish list of mitigation projects when federal post-disaster funds become available. However, this structure does not foster widespread collaboration and joint problem solving, as is evidenced by the atomized way in which the consultants met individually with each stakeholder group, consolidated and analyzed the data, and wrote the plan so that it will meet state and federal criteria for approval.

While the project-oriented approach may explain much of the failure to include land use approaches in the future-oriented aspects of the plan (i.e. proposed policies and implementation), nothing in that approach precludes a thorough review of Brevard County’s existing land use planning context. It would appear that this important shortcoming in the LMS is due to the lack of involvement of local planners and the formulaic approach taken by the consultant. Likewise, the failure of the LMS to clearly present the county’s overall vulnerability, existing capabilities, and its future-oriented strategy in a readable document may be due to limited involvement of planners who bring experience using plans to communicate with a wide audience of key stakeholders, elected officials, and the general public. Not all of the blame for limited involvement of local planners can be placed on state and federal influences on local officials, however. Nor can emergency managers, who argued that mitigation planning should be a local planning function, be held solely responsible. Major cuts to the county planning department and a pro-growth political environment are also key factors that have to be contended with in Brevard County.
Appendix III

Strong but Stove Piped in Martin County

Robust Land Use and Hazard Mitigation Planning Efforts Take Place

in Isolation From Each Other

Martin County, Florida has a strong history of growth management and its comprehensive plan includes an array of land use tools used to limit development throughout the community, including in environmentally sensitive and hazardous areas. At the same time, Martin County has a detailed hazard mitigation plan that extensively reviews existing mitigation capabilities and lays out a future-oriented strategy with a list of prioritized projects for implementation. As evidence from the county’s mitigation plan and survey responses from six mitigation planning committee members and interviews with five key stakeholders\(^1\) show, Martin County has not thoroughly integrated its land use planning strengths into its hazard mitigation planning and implementation efforts. Emerging post-disaster recovery planning efforts are strengthening linkages between emergency managers, local planners, and the broader array of stakeholders, however. This case study demonstrates how the interplay of the state policy context and characteristics of the county’s hazard mitigation stakeholder network in Florida has 1) focused Disaster Mitigation Act (DMA) compliant hazard mitigation planning and implementation on project-oriented approaches and 2) limited integration of DMA mitigation planning with a strong, pre-existing growth management program.

This chapter consists of a brief description of the case setting (section III.1), followed by a summary of two types of hazard mitigation planning outputs: the incorporation of land use approaches into the hazard mitigation plan (III.2) and ongoing implementation of land use approaches to mitigation (III.3). It then reviews the influence of four aspects of local mitigation planning on

\(^1\) Interviews were conducted with two county emergency management officials, one county growth management (planning) official, one regional planning official, and one municipal public works official. See Chapter 4 for more detail on the selection and procedures for the interviews.
mitigation planning outputs: the planning process used to develop the plan (III.4) the network diversity (III.5), the network structure (III.6), and bridging the expertise boundary between emergency managers and planners (III.7). The interplay of local community characteristics and the state policy context with the planning process and network-oriented characteristics are addressed throughout. The chapter concludes with a summary of the key findings from the case (III.8).

III.1. Case Setting

Martin County is located on the east coast of Florida and in 2000 its population was 126,731 (Martin County Unified Local Mitigation Strategy 2010.) Development is concentrated in the eastern part of the county in Stuart (population 22,100 in 2000) and smaller communities on the barrier islands, while the western part of the county primarily consists of agricultural and conservation land (MCULMS 2010). Population grew 15.4% between 2000 and 2010 and population density was 263 people per square mile in 2010 (Census 2000 and 2010). Martin County’s socio-economic profile is one of a county with higher median home values, lower poverty rates, and more highly educated adults than the national average (see Table V.1 in Appendix VI). The county has a history of environmental conservation and strict land use controls intended to limit density and address quality of life issues such keeping traffic levels low.

Coastal storms and flooding pose the greatest hazard threats to Martin County (MCULMS 2010). Since 2000, Presidential Disaster Declarations include Hurricanes Frances, Jeanne, and Wilma in 2004 and 2005 and Tropical Storm Fay in 2008. In terms of ongoing exposures, the three natural hazards evaluated as having ‘catastrophic’ potential in the county are floods, hurricanes/tropical storm, and epidemic. Nine percent of county’s land area and eleven percent of its occupied housing units are in flood zones (see Figure III.1) (MCULMS 2010). In terms of repetitive loss properties, as of 2009, there are 195 properties in Martin County and payments of $13.0 million for building damages and $3.4 million in contents damages have been made on these properties (MCULMS 2010). These socio-economic and hazard exposure factors appear to provide a solid foundation of capacity for incorporating land use approaches into hazard mitigation efforts.
III.2. Planning Outputs: Hazard Mitigation Plan Quality

Martin County’s current Local Mitigation Strategy (LMS), which serves as its Disaster Mitigation Act-compliant hazard mitigation plan, was adopted in 2010. The LMS is a well-organized, 352-page document more or less evenly split between the main body of the plan and seven appendices. Most of the plan is contextualized to the specific conditions of Martin County and its participating jurisdictions, although selected portions of the text appear to have been developed by consultants for use in multiple plans and received little apparent modification to make it specific to Martin County (e.g. Appendix B: Mitigation Options and Appendix C: Funding Sources). Figures, tables and charts are included throughout and the formatting of the document is reader-friendly if plain. Overall, the plan presents a clear and detailed overview of Martin County’s vulnerability, existing capabilities, and project-oriented approach to reducing risk in the future.
The introductory sections of Martin County’s LMS articulate the need for a central role for land use approaches to mitigation. The executive summary notes that “[w]hile a major focus of mitigation is on retrofitting, the most effective time to mitigate is before development orders are approved” (MCULMS 2010, page ES-2). Similarly, the purpose and overview section of the plan states “[m]itigation planning allows communities to consider the vulnerability of land that is currently undeveloped but may be developed in the future, as well as the risk to people and property on existing developed land” (MCULMS 2010, page 1:1). Yet, of the three principles of plan quality reviewed here, only the fact base principle, which reviews past actions and establishes baseline conditions, reflects strong integration of land use and hazard mitigation. The future-oriented principles of policies and implementation largely miss opportunities to make strong connections.

III.2.a. Fact Base Principle: Capability Assessment

In the main body of the LMS, an Institutional Analysis section details governmental and non-governmental organizations working on mitigation at the federal, state, regional and local levels and the relevant plans, policies and programs of those organizations. It indicates that the Future Land Use, Coastal Management, Intergovernmental Coordination, and Capital Improvements elements of the Martin County Comprehensive Growth Management Plan are relevant to and support hazard mitigation efforts. It includes a set of recommendations for strengthening the role of local governments in mitigation, such as increasing connections between the LMS and the Comprehensive Plan and the development review process. A subsequent section of the plan, titled Mitigation Options, charts the range of mitigation approaches available, including some innovative approaches such as floating zoning, transfer of development rights and impact fees. The options are not contextualized for the unique circumstances of Martin County and instead read like language included by consultants in multiple plans.²

² The LMS notes that fifty documents were reviewed, especially guides from FEMA and the North Carolina Division of Emergency Management, to develop the menu of options for mitigation.
An appendix to the main body of the plan details more than 100 specific policies and objectives in the Martin County Comprehensive Plan supporting hazard mitigation (see Figure III.2 for examples). A selection of land use policies highly relevant to hazard mitigation includes 1) minimizing land development and public facilities in the coastal high hazard area; 2) approving only single-family homes in certain hazardous areas at a density not higher than two units per acre; 3) encouraging low density land use in the coastal high hazard area; and 4) limiting construction in hurricane surge areas for category 1, 2 and 3 hurricanes (MCULMS 2010). Driving along the barrier islands from Martin County into either St. Lucie County to the north or Palm Beach County to the south provides striking visual evidence of these policies’ impacts (see Figure III.3). In both cases, the buildings immediately transition from four stories or less in Martin County (mostly single family homes) to high-rise towers on the beach once in the neighboring counties. Interviewees pointed to quality of life concerns (e.g. limiting density and traffic, etc.) rather than motivations to mitigate hazard risks as the historical reason Martin County has very restrictive land use regulations compared to neighboring counties. Finally, the LMS does not include maps illustrating existing zoning or land use patterns. By default, the LMS does not overlay this information on maps of hazardous areas – or vice versa – which limits assessment of whether existing zoning and land use patterns are supportive of hazard mitigation.
Figure III.2: Excerpt of Martin County Comprehensive Plan Objectives and Policies included in LMS (MCULMS 2010, Appendix A)

Table A.1. (Continued).

<table>
<thead>
<tr>
<th>Objective/Policy/Discussion</th>
<th>Source</th>
<th>Notes on Hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>To limit public expenditures in the designated CHHA to necessary public services in order not to subsidize new development in this area.</td>
<td>Martin County Comprehensive Plan, Dec. 2002, Coastal Management Element, Policy 8.4.B.1</td>
<td>Erosion, Flood, and Hurricane Mitigation</td>
</tr>
</tbody>
</table>

In order to limit public expenditures in the CHHA, Martin County will
1) Continue to approve only detached single-family development in residentially designated areas in the Hutchinson Island area, not exceeding two units per gross upland acre;
2) Supply water and/or sanitary sewer services necessary to correct deficient systems that are polluting the Indian River Lagoon, or other environmentally sensitive water bodies. Septic tanks will only be approved on lots one-third acre (14,520 square feet) or larger, provided they are served by central water and meet all other Health Department criteria;
3) Provide services necessary to ensure public access to beaches and/or other public waterfront recreation/conservation areas;
4) Provide services needed to minimize evacuation times during emergency events as specified in the policies of Subsection 8.4.B of this section of the Coastal Management Element; and/or
5) Provide those services that restore or enhance natural resources.

V.2.b. Policies Principle: Mitigation Strategy

Incorporation of land use approaches into the mitigation strategy of the LMS, which addresses the policies principle of plan quality, is quite limited. The plan focuses almost exclusively on project-oriented approaches. Martin County’s future-oriented actions are organized into a Project Prioritization List (PPL), which the plan identifies as the “heart of the LMS” (MCULMS 2010, page 6-10). The PPL list consists of prioritized projects and is intended to “speed local receipt of Federal disaster mitigation funds after a disaster” (MCULMS 2010, page ES-3). The PPL is regularly updated as projects are completed. Martin County’s project-oriented mitigation strategy clearly aligns with the state of Florida’s approach to focusing local mitigation planning on prioritizing local project wish lists before a disaster occurs (Smith, Lyles and Berke Forthcoming).
County-level projects in the PPL include multiple drainage projects and municipal-level projects focus on drainage, stormwater, and retrofitting public building and infrastructure, although the municipalities do propose a few emergency services and debris removal projects as well. The one land use related exception is a county-level proposal for a “review of county development regulations to determine changes [that] could be made to make future buildings and infrastructure less vulnerable to the impact of disasters” (MCULMS 2010, page 6-19). The project has an ‘unranked’ priority, appears last on the list of proposed actions, and is sponsored by Martin County engineering, which did not serve on the steering committee for the 2010 plan. Notably, the project-oriented, PPL approach taken by Martin County – in line with state of Florida expectations – means that the
recommendations for better integration hazard mitigation and land use planning included in Institutional Analysis section of the plan are not included in the mitigation strategy.

III.2.c. Implementation Principle: Implementation Information

Information in the LMS about how Martin County will implement specific projects on the Project Prioritization List is very detailed, while implementation information about land use approaches is general and lacks the kinds of detail that provides accountability. For the drainage, retrofitting and other projects that are included in the PPL, detailed implementation information (i.e. the sponsoring agency, cost, priority rank, potential funding sources, ongoing timeframe, and objectives and mitigation accomplished) is included in a table in the LMS (See Figure III.4). As noted above, most projects are not land use related and land use planners are not tasked with responsibilities in the PPL. Notably, comparable implementation information is lacking for the land use approaches to mitigation included at the end of the Institutional Analysis section. Thus, the list of land use approaches includes laudable “suggestions” (page 3-29) for consideration but those suggestions are not of the same level of importance as the prioritized projects on the PPL.

Implementation of the LMS is also addressed in terms of the incorporation of the LMS into other planning initiatives, but that material in the LMS lacks coherence and breadth. In line with the project-orientation of the LMS in general, the focus is on coordinating capital projects rather than coordinating policy. The implementation chapter of the LMS identifies the local governments’ comprehensive plans as the “cornerstone of growth management in Florida” and “extremely important vehicles to implement hazard mitigation” (MCULMS 2010, page 6-8). Subsequent sentences emphasize incorporating the LMS Project Prioritization List into the Capital Improvement Elements (CIEs) of the Comprehensive Plan on an annual basis. Procedurally, the LMS indicates that emergency management staff will send letters to local planning directors asking for their participation on the LMS steering committee. Interestingly the plan notes that the “LMS steering committee have experienced limited success with integration of LMS into local plans due to several reasons”
(MCULMS 2010, page 6-8). What is meant by “limited success” is not defined and the reasons are not expanded upon.

**Figure III.4: Excerpt of Project Prioritization List** (MCULMS 2010, page 6-15)

<table>
<thead>
<tr>
<th>Project Title and Description</th>
<th>Sponsor</th>
<th>Cost</th>
<th>Supporting Objective</th>
<th>Prioritized Rank</th>
<th>Potential Funding Sources</th>
<th>Mitigation Accomplished</th>
<th>completion time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manatee Creek Drainage</td>
<td>Martin County engineering</td>
<td>$2,500,000</td>
<td>1.1, 1.5</td>
<td>15</td>
<td>CDBG, PWIP, FCP, NFMF, PA, STP</td>
<td>Reduces Flooding Vulnerability</td>
<td>more than a year</td>
</tr>
<tr>
<td>Finney Drive Drainage</td>
<td>City of Stuart engineering</td>
<td>$85,000</td>
<td>1.1, 1.5</td>
<td>16</td>
<td>CDBG, PWIP, FCP, NFMF, PA, STP</td>
<td>Reduces Flooding Vulnerability</td>
<td>more than a year</td>
</tr>
<tr>
<td>Old Palm City Drainage</td>
<td>Martin County engineering</td>
<td>$1,300,000</td>
<td>1.1, 1.5</td>
<td>17</td>
<td>CDBG, PWIP, FCP, NFMF, PA, STP</td>
<td>Reduces Flooding Vulnerability</td>
<td>more than a year</td>
</tr>
<tr>
<td>Harden Jupiter Island Public Works Building</td>
<td>Town of Jupiter Island engineering</td>
<td>N/A</td>
<td>1.1, 1.3</td>
<td>UN</td>
<td>EMPA, PDM, EOC</td>
<td>Strengthen emergency response facility</td>
<td>more than a year</td>
</tr>
<tr>
<td>Gomez Road Drainage</td>
<td>Town of Jupiter Island engineering</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**III.3. Planning Outputs: Implementation of Land Use Approaches to Mitigation**

The sole land use action included in the LMS Project Prioritization List is not being implemented, according to interviews with key stakeholders. No progress has been made to “[r]eview county development regulations to determine changes [that] could be made to make future buildings and infrastructure less vulnerable [to] the impact of disasters” (MCULMS 2010, page 6-19). A county emergency management agency official indicated that “given the political environment at [the] local and state level, [it] will not happen soon.” Multiple capital projects included in the PPL, such as drainage improvements, have been completed – often with local funds because of slow and cumbersome review of post-disaster grants by state and federal officials. In fact, when asked what mitigation actions were currently being worked on, one interviewee responded: “None [-] either they are completed or have been removed.”
In contrast to the bleak picture of the LMS’s effectiveness in promoting land use approaches to mitigation, survey and interview responses from key stakeholders indicate that mitigation-beneficial aspects of Martin County’s strong growth management program are being implemented (Table III.1). For example, an emergency management agency official said “early in the history of Martin County the leaders recognized the value of limiting the density on barrier islands[;] this ordinance stands to this day.” Overall, while land use approaches to mitigation are not a core part of future-oriented parts of the LMS, Martin County mitigation stakeholders are engaged in land use planning efforts with mitigation benefits.

Table III.1. Committee Members’ Self-Reported Efforts to Implement Land Use Actions

<table>
<thead>
<tr>
<th>Land Use Action Type</th>
<th>Percent of Committee Members Reporting Effort (Number reporting/total respondents)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limit development in hazardous areas</td>
<td>33% (2/6)</td>
</tr>
<tr>
<td>Setbacks, buffers and regulations to protect natural mitigation features</td>
<td>50% (3/6)</td>
</tr>
<tr>
<td>Elevating or Acquiring Properties</td>
<td>17% (1/6)</td>
</tr>
<tr>
<td>Acquire land to protect natural mitigation features</td>
<td>33% (2/6)</td>
</tr>
<tr>
<td>Incorporate hazard mitigation plan into other planning initiatives</td>
<td>67% (4/6)</td>
</tr>
<tr>
<td>Land use modeling and/or analysis</td>
<td>50% (3/6)</td>
</tr>
</tbody>
</table>

III.4. Local Mitigation Strategy Development and Update Process

Since adoption of its initial Local Mitigation Strategy (LMS) in 1999, Martin County has experienced a decline in interest and participation in its mitigation planning efforts. Key aspects of the planning process that have influenced the incorporation of land use into the hazard mitigation plan include the involvement of consultants and local planners in early versions of the LMS but not the most recent update. This influence is most evident in the capability assessment of the mitigation plan.
Martin County adopted its first LMS in 1999 in accordance with requirements from the Florida Department of Community Affairs Division of Emergency Management (MCULMS 2010). Interviews with key stakeholders indicate that a private contractor was hired using state planning grants. Generally, stakeholders were enthusiastic to participate because of the potential availability of funding for local projects. The original 1999 LMS was updated in 2003 and 2004 through a process involving five meetings with a steering committee, including planners from Martin County Growth Management (MCULMS 2010). The consultant, Continental Shelf Associates, facilitated the planning process and the revised version of the LMS was adopted in 2005.

The influence of county planners on the quality of the LMS is evidenced in the review of more than 100 specific land use-related policies and objectives from the county’s comprehensive plan – all of which date from before the 2003/2004 update process – in the mitigation plan’s capability assessment. County planners’ intimate working knowledge of the comprehensive plan and its policies enabled them to excerpt the material relevant for inclusion in the mitigation plan and share that with the consultants who developed the plan. Similarly, the influence on the quality of the LMS of the consultants is observed in the overall quality of the plan. Specifically, in regards to land use, the consultants appear to have developed the sections of the capability assessment that review the wide range of options, including innovative development management techniques, available to Martin County. Together, the county planners and consultants appear to be responsible for the hazard mitigation plan reflecting the county’s long-standing, aggressive growth management program and its relevance to hazard mitigation efforts.

In accordance with federal requirements for five-year updates, the 2005 LMS was revised through a planning process conducted in 2009 (MCULMS 2010). In absence of planning grant funding from FEMA or the state DEM, a private contractor was not used and instead the process was led and facilitated by Martin County Emergency Management Agency staff. One meeting of the LMS steering committee took place in early 2009 and comprised the participatory aspect of the process. More than 35 state, regional and local governments, private business, and non-profit
organizations were invited to serve on the steering committee and 11 participated. Delays and difficulties in obtaining federal post-disaster grant funds following the 2004 and 2005 hurricanes had reduced interest among many stakeholders in the hazard mitigation planning process. Notably Martin County Growth Management did not participate.

The continued use of the plan template generated by the consultants for the 2010 version of the plan minimizes the negative impact that might have resulted from the lack of outside help in the 2009 planning process. However, the lack of involvement of county planners in the 2009 update process does appear to have had negative impacts on the plan’s quality. First, all of the 100-plus policies and objectives excerpted from the comprehensive plan predate the 2005 update to the LMS (MCMULS 2010). It stands to reason that inclusion of county planners in 2009 might have led to more up-to-date information on policies from the comprehensive plan. Alternatively, it is possible that there had been no changes to the comprehensive plan relevant to mitigation between 2002 and 2009 and county planners were not included based on that information. In that case, the conclusion would be county planners were considered relevant to the development of the LMS as a source of information about existing comprehensive planning policies in 2005, but not as stakeholders needed to update the future-oriented policies and implementation sections of the plan. Second, the county comprehensive plan was being updated in 2009 over roughly the same period as the LMS update process. Yet, efforts to more closely link the LMS and comprehensive plan are not evident in the LMS and were not discussed during interviews. Both of these examples indicate that local officials in Martin County view a one-way relationship between the plans. That is, as one interviewee indicated, policies in the comprehensive plan can be used to justify or support proposed LMS projects, but LMS projects have little bearing on comprehensive plan policies. This dynamic exhibits the interplay between the state’s project-oriented approach, which puts land use issues in secondary positions of importance, and limited involvement of local planners in mitigation efforts, which reduces opportunities to more strongly link ongoing land use and hazard mitigation efforts.
Minutes from the January 2009 steering committee meeting indicate that the committee focused on reviewing and updating the list of projects to try and get funded through federal disaster programs, including funding available through the Tropical Storm Fay disaster declaration (MCULMS 2010). Here again, in accord with the project-oriented state policy context, the local focus is on securing funding and completing projects, not changing local policies and influencing development patterns. Of six steering committee members who responded to the survey conducted for this dissertation, most worked on the plan infrequently.3,4

### III.5. Hazard Mitigation Stakeholder Network Diversity

Surveys of six of ten LMS steering committee members from the 2009 planning process who are still in the mitigation network (see Chapter 4 for more information on survey methodology) enabled further exploration of the relationship between the diversity of stakeholders in the mitigation network, including the assets they brought to the planning process, and mitigation planning outputs. This analysis indicates that a diverse array of groups was engaged in mitigation planning in Martin County, while reinforcing the conclusion of limited involvement of planners. The eleven members of the LMS steering committee represented the county Emergency Management, Health, Sheriff, Schools, and Council on Aging agencies, as well as the City of Stuart fire department, the Town of Jupiter Island building department, Martin Memorial Hospital, the Business Development Board, and the Salvation Army. Among survey respondents, four described their professional expertise as emergency management, one public health and one schools. This mix of organizations and expertise covers many key policy domains need to address hazard mitigation such as public safety, health care, and advocates for especially vulnerable populations. Yet not only were neither county nor municipal

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3 In responses to a survey for this dissertation, two committee members indicated that they worked on the mitigation plan daily to a few times a week during the update process, while four indicated they worked on it less than once a month.

4 Public participation was negligible to non-existent in spite of efforts to generate interest in the process. The general public was invited to review and comment on the draft plan online or at a public library and public notices for the meeting were advertised in the media.
planners represented on the steering committee roster, none of the respondents indicated that they brought land use planning professional training to the network.\(^5\)

Beyond professional specializations and expertise, there are specific stakeholder assets that can contribute to plan making in general and to incorporating land use in mitigation planning in particular. In terms of the individual members’ mitigation-related experience, all survey respondents indicated six or more years working on mitigation. In terms of skills related to developing a plan, all six respondents brought outreach and communication skills and four brought skills in facilitation, mediation and conflict resolution. These generic mitigation plan-making skills contributed to a very solid plan in terms of overall quality.

When it came to land use planning related assets, though, the committee was weaker. No committee members indicated analytical technical skills, such as GIS and HAZUS, which may explain the mitigation plan’s limited analysis of land uses, zoning, and hazardous areas. Mapping and spatial analysis fall into the range of practices land use planners are often trained to do and, had they been more involved in the 2009 mitigation planning process, local planners might have provided those skills. Skills related to ongoing plan implementation were limited as well. Two stakeholders indicated skills in plan and/or site review and none indicated executive or legislative authority for rule making or budgeting. These gaps in steering committee assets correspond to the lack of attention paid to land use approaches in the future-oriented aspects of the plan.

Another important asset in the context of integrating land use approaches into hazard mitigation is favorable views about preventative land use approaches to mitigation among stakeholders. As seen in Table III.2, Martin County stakeholders indicated generally favorable views of preventative land use approaches and related natural resource protection approaches (e.g. wetland conservation), but the preventative land use score was tied for the lowest among the six categories. Project-oriented approaches - emergency services and property protection – approaches received

\(^5\) Interviewees from the county and city of Stuart corroborated these finding and mentioned engineering and public works officials as key stakeholders also.
more favorable responses. These views fit with approach to mitigation promoted by the state of Florida and are reflected in the Prioritized Project List included in the mitigation plan.

**Table III.2: Martin County Stakeholder Views on Effectiveness of Mitigation Approaches**

<table>
<thead>
<tr>
<th>Mitigation Approach</th>
<th>Mean Score *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property Protection</td>
<td>4.2</td>
</tr>
<tr>
<td>Information</td>
<td>3.8</td>
</tr>
<tr>
<td>Preventative Land Use</td>
<td>3.8</td>
</tr>
<tr>
<td>Emergency Services</td>
<td>4.2</td>
</tr>
<tr>
<td>Structural Controls</td>
<td>3.8</td>
</tr>
<tr>
<td>Natural Resource Protection</td>
<td>4.0</td>
</tr>
</tbody>
</table>

\( n = 6 \)

* 5.0 Very effective to 1.0 Very Ineffective

**III.6. Hazard Mitigation Stakeholder Network Structure**

Digging even more deeply into the mitigation stakeholder network to examine the patterns of relationships between stakeholders provides additional explanations of the focus on project-oriented approaches to mitigation rather than land use approaches in the plan. Overall, the Martin County mitigation stakeholder network described above has been a small, inactive, ‘opinion-leader’ network in recent years after having been larger and more active when access to federal disaster mitigation funds seemed more promising. First, the network of stakeholders sharing hazard mitigation related information in recent years is relatively small. Survey responses indicate 17 organizations total in the network, 10 of which were represented by LMS steering committee members.\(^6\) The network exhibits a ‘star’ structure associated with an opinion leader network with one stakeholder attracting almost all of connections and most other stakeholders having one or few connections (i.e. preferential attachment) (see Figure III.5). By all measures, Martin County Emergency Management Agency (the triangle in the center of the network labeled “A”) was the central stakeholder for information-sharing. It had the highest degree centrality, as it was part of nine of the thirteen total connections in the

\(^6\) Six of the seventeen organizations are not shown on the figure because they are isolates; that is, they are stakeholders with no connections to other stakeholders reported by either the isolate or the other organizations in the network. One of the committee members is the Jupiter Island building inspector/plan reviewer, who, as noted later, is left the network soon after completion of the LMS.
network, and the highest betweenness centrality because it serves as the only broker for connections between almost all other stakeholders in the network.\footnote{The degree centrality of the Emergency Management department was 9 (i.e. connections to nine other stakeholder organizations), while the next closest degree centrality was 5. Its betweenness centrality score was 46, which is difficult to interpret in isolation; the next closest score was 20.}

The other stakeholders in the network were peripheral when compared to the county Emergency Management Agency. The only organization in the network with more than two ties to stakeholders other than the county Emergency Management Agency was Martin County Public Health (the circle labeled “B” with five connections). The other two emergency management agencies in the network (also represented by triangles) were the Florida Division of Emergency Management (labeled “C”) and FEMA (labeled “D”). The lone planning organization connected to the network was the Treasure Coast Regional Planning Council (TCRPC), which is represented by the diamond labeled “E”. The individual staff person representing the TCRPC was an emergency planner, whose training was in a field other than land use planning.

Interviews with key stakeholders corroborated the findings from the survey data. There was consensus among the interviewees that the county emergency management agency was central in the network. Emergency managers viewed their role coordinating the LMS as filling a diplomatic role to ensure balanced distribution of funding among stakeholders. Their intentional focus on securing and distributing mitigation funding demonstrates the strong influence of the state of Florida’s approach to coordinating local mitigation efforts. Other stakeholders interviewed described themselves as operating on the periphery of the network, providing input through intermittent emails and at steering committee meetings on a roughly annual basis.
Figure III.5 Martin County Information Sharing Network

Organization Expertise Type

- ▲ Emergency Management
- ◆ Planning
- • Other Expertise
Altogether, the description of the network structure provides further explanation of why Martin County’s future-oriented aspects of its mitigation plan fail to incorporate land use approaches. The ‘opinion-leader’ structure – while useful for efficiently consolidating information into a plan and distributing information (e.g. about eligibility for federal disaster funding) – does not foster the type of joint problem solving needed to grapple with reducing hazard risks through land use approaches. The structure has placed emergency managers in the key position of power and responsibility, reinforcing the project-oriented approach promoted by the state. Meanwhile, the capacity of the network to engage land use issues is substantially impaired by the lack of local planners in the network, who are absent even from peripheral positions.

Additional insights about the influence of state – and federal – mitigation priorities are provided by considering the evolution of the network over time. Stakeholders described the network as small and inactive in recent years and explained that state and federal implementation of the LMS/DMA program had led to increasing frustration and decreasing interest in mitigation planning over the last five to seven years. After the hurricane Frances and Jeanne disaster declarations in 2004-2005 local officials waited two to three years for grant application project review by state and federal mitigation officials. Over that period local matching funds were lost or local governments elected to go ahead and complete pressing projects using other funding sources such as local capital budget or Community Development Block Grant funds. By the fourth year after the disasters, county and municipal stakeholders withdrew most projects because, as one stakeholder noted, the benefit of dedicating local staff time to “chase redundant and irrelevant requests from state and federal HMGP project staff exceeded the benefit of the federal funding.”

Similar challenges have been faced with subsequent declarations for hurricane Wilma and tropical storm Fay. Stakeholders did express some

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8 An individual example of the extended timeframes for obtaining post-disaster funds, albeit one with a successful conclusion, is that the City of Stuart began construction in 2010 of its Memorial Park drainage project using HMGP funds available from one of hurricane declarations in 2004 or 2005. During a site visit in 2012 construction was nearing completion – more than a half dozen years after the original disaster declaration.
hope that the process was going to improve because state mitigation officials communicated recently that they were aware of the problems and were trying to fix them.

In an interesting contrast to the descriptions of the relatively inactive mitigation network, interviewees indicated that many stakeholders have participated more actively in emergency preparedness and response efforts, such as working at the Emergency Operations Center when it was activated during a hazard event. Also, a new State Homeland Security Grant Program-funded post-disaster recovery plan (PDRP) process was begun in 2011 and a broader range of stakeholders was involved in the PDRP process than in mitigation efforts. The PDRP process was taking place concurrently with a regional vulnerability assessment conducted by the Treasure Coast Regional Planning Commission with Hazard Mitigation Grant Program funds. Thus, the broad network of local stakeholders with an interest in reducing hazard losses was more active on emergency preparedness, response, and even recovery efforts than mitigation efforts. These other networks with more activity by local planners point to the strong influence of the state’s approach to mitigation on who participated in the mitigation planning process, which in turn has shaped the plan and its implementation.

III.7. Bridging the Emergency Management – Land Use Planning Expertise Boundary

The descriptions of the planning process, network diversity, and network structure above have foreshadowed the observation that the expertise boundary between emergency planners and local planners is not well bridged in Martin County’s mitigation efforts. As noted earlier, although county Growth Management planners participated in the LMS update completed in 2005, neither county nor municipal planners were involved in the process of updating the LMS in 2009. The expertise boundary between emergency managers and land use planners was self-evidently not bridged due to the absence of county or municipal planners from the network and the fact that the TCRPC representative was an emergency planner not a local planner with land use training or experience (see Figure III.5). Corroborating these conclusions, an emergency management

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9 It was scheduled to be completed in the summer of 2012.
interviewee indicated that land use planners were not tasked with responsibilities in the LMS because it was rare for any of the projects in the mitigation plan to relate to land use changes. These findings suggest that the state’s approach to mitigation has shaped who participated in local mitigation efforts. Thus, the state not only shapes the mitigation plan and implementation directly through its guidance and review of the content of plans, but also shapes them indirectly by communicating to local emergency managers that local planners are, at best, peripheral stakeholders for hazard mitigation.

Interestingly, the ongoing post-disaster recovery planning (PRDP) process mentioned above appears to be strengthening the ties between emergency managers and local planners in a way mitigation planning efforts have not. While the county Emergency Management Agency obtained the funding for the post-disaster recovery plan (PDRP), a county Growth Management planner serves as the coordinator for the process. An emergency management official explained the rationale for having Growth Management coordinate the process by indicating that recovery planning was seen as much more of a land use function than mitigation. Once completed, the PDRP will need to be related back to the comprehensive plan and get approval from the Board of County Commissioners. Historically growth management issues in Martin County have been highly politicized and often quite contentious, meaning growth management planners have extensive experience working with a diversity of non-governmental stakeholders and the elected county commissioners. An emergency management official stated that emergency managers do not have the same connections or experience. The official indicated that the connections and credibility Growth Management planners bring to the table have been responsible for the interest and enthusiasm of a wider range of stakeholders for the PDRP process than ongoing LMS efforts. These nascent, but promising, connections around recovery planning further drive home conclusions about the constraining influence of the top-down, project oriented approach to mitigation taken by the state of Florida on the hazard mitigation network and, in turn, the hazard mitigation plan and its implementation.
III.8. Summary

By detailing the integration of land use approaches into mitigation planning and related efforts in Martin County over the last five to ten years, this case illustrates the interplay of characteristics of the hazard mitigation stakeholder network and state implementation of the Disaster Mitigation Act. Initially, the promise of state and federal funding, bolstered by planning grants to develop a Local Mitigation Strategy (LMS), generated enthusiasm for mitigation planning in Martin County. The resulting participation of stakeholders increased the capacity of the county’s mitigation network to develop its LMS. Martin County Growth Management planners made the important contribution of a thorough review of policies and objectives in the Martin County Comprehensive Growth Management Plan that support hazard mitigation. The summary of land-use related polices was included in the LMS and provided support and justification for mitigation projects included in the LMS’s Project Prioritization List. But, in the most recent update process, local planners were not involved and new land use planning related information or analysis was not incorporated in the update.

From the outset the state of Florida set expectations for local governments to take a project-oriented approach in LMSs, which is reflected in the lack of land use in the future oriented policies and implementation principles of the plan. In the years following two major disaster declarations of 2004 and 2005, local stakeholders struggled with slow and cumbersome state and federal review of grant applications. Over time, the initially alluring promise of increased mitigation funding through LMS and DMA mitigation planning had withered. Interest, enthusiasm, and participation in the mitigation stakeholder network decreased. An emergency management official’s comment illustrates how little value is currently placed in the hazard mitigation planning process as required by the state and federal government. “If the LMS program were to start to resemble the tool that it is portrayed to be, we being emergency management would again become the local cheerleader for a program which offers local government timely significant funding to address urgent mitigation projects following local disaster” [emphasis in original response.]
By tying mitigation planning in Florida so closely to grant eligibility, state mitigation officials have put most of their eggs in one basket. When funding did not materialize as expected, even the most central mitigation stakeholders came to view mitigation planning as serving little other purpose than meeting mandate requirements from higher levels of government. Arguably, another consequence of the state’s focus is depressed interest in mitigation among local planners and perceptions of limited relevance of local planners for mitigation among emergency managers.

An additional challenge to mitigation planning in Martin County is the effect of stakeholder turnover in a small, opinion-leader network. Three of the steering committee members from 2009 are no longer in their positions, which may be common in local governments in the current economic climate. The main problem arises in the fact that one of the three members no longer in the network is the longstanding emergency management agency director who retired during the process of developing this case study (February 2012). While other emergency management agency staff have been involved in mitigation efforts for many years also, the director was clearly the hub of the network for mitigation efforts and along with his experience and localized knowledge he took with him numerous connections built and maintained over many years. In a relatively small county where stakeholders reported knowing each other it seems unlikely the network will substantially fragment or dissolve, but the director’s retirement may reduce the strength of key inter-organizational connections in the network with the result that the already small and inactive network becomes even less effective.

There are silver linings for mitigation efforts in Martin County evident in this case study. Martin County’s restrictive land use regulations have stood the test of time and prevented egregiously bad development decisions like those observed in adjacent counties (e.g. high rise buildings on barrier island beaches). Also, the emerging post-disaster recover plan process shows signs of greater cooperation between local planners and emergency managers and recognition of the tight links between land use and disaster recovery.
Appendix IV

Tenuous Ties in Onslow County

Turnover in Stakeholder Network and Pro-Development Political Considerations

Constrain Mitigation Efforts and Integration of Land Use

Onslow County, North Carolina is home to a major Marine Corps base, five autonomous municipalities, a barrier island and estuary, and a pro-growth political climate. The county’s hazard mitigation plan includes detailed information about the hazards faced locally and existing capabilities to address those hazards, but synthesis and analysis of that information in the plan are limited, which weakens the foundation for an innovative mitigation strategy. As evidence from the county’s mitigation plan, survey responses from seven mitigation planning committee members, and interviews with eight key stakeholders\(^1\) show, the network of mitigation stakeholders has been in flux in recent years due to turnover of key staff. Connections between emergency managers and local planners have existed and been valued by both, but have been weak or indirect. This case study demonstrates how peripheral inclusion of local planners in an unstable network of mitigation stakeholders working in a pro-development political climate has 1) injected a muddled set of land use considerations into Disaster Mitigation Act (DMA) compliant hazard mitigation planning and 2) limited efforts to strengthen implementation of a weak program of land use regulations.

This chapter consists of a brief description of the case setting (section IV.1), followed by a summary of two types of hazard mitigation planning outputs: the incorporation of land use approaches into the hazard mitigation plan (IV.2) and ongoing implementation of land use approaches to mitigation (IV.3). It then reviews the influence of four aspects of local mitigation planning on mitigation planning outputs: the planning process used to develop the plan (IV.4) the network diversity (IV.5), the network structure (IV.6), and bridging the expertise boundary between

\(^1\) The interviewees include two county emergency management officials, two county planning officials, one county geographic information systems official, two municipal fire officials, and one municipal planning official. See Chapter 4 for more information on the selection and interview procedures.
emergency managers and planners (IV.7). The interplay of local community characteristics and the state policy context with the planning process and network-oriented characteristics are addressed throughout. The chapter concludes with a summary of the key findings from the case (IV.8).

IV.1. Case Setting

Onslow County (see Figure IV.1) is a coastal county located in southeastern North Carolina and in 2000 its population was 150,355 (Census 2000). Development is concentrated around Jacksonville (population 66,715 in 2000) and four smaller municipalities are located in the county, including North Topsail Beach, a barrier island community with a permanent year round population of 843 that swells to 10,000 or more in the summer (Census 2000). Population in Onslow County grew by 18.2% percent between 2000 and 2010 and the county had a population density of 232 people per square mile in 2010 (Census 2000 and 2010). A major driver of population growth has been Camp Lejeune Marine Corps Base, which comprises nearly 1/3 of the county’s area and is located between Jacksonville and the coastline. In spite of the national economic downturn of the late 2000s, increases in military activity over the last decade and reassignment of military resources to Camp Lejeune have resulted in an ongoing boom in the local economy, including large amounts of new development, especially housing. Socio-economically, the county has lower median home values, higher poverty rates, and fewer highly educated adults than the national average, which fit with the young and highly transient population associated with the military base (see Table VI.1 in Appendix VI). Jacksonville and Camp Lejeune straddle the New River, a short, wide estuary that opens into the Atlantic Ocean.

From the 1960s through the 1990s, Onslow County suffered few major disasters. Then a series of Hurricanes – Bertha, Fran, Bonnie and Floyd – devastated areas of eastern North Carolina between 1996 and 1999 and Onslow County was included in Presidential Disaster Declarations for each of the four Hurricanes. In particular, Hurricane Fran resulted in 4 deaths, 4 injuries and had a $347 million economic impact on Onslow County, with more than 4,926 homes affected or damaged, 409 businesses damaged and $287 million in private property damage (Onslow County Multi-
Jurisdictional Hazard Mitigation Plan 2009). Since the late 1990s there was one additional Presidential Declared Disaster, Hurricane Ophelia in 2005.² Twenty-one percent of the land area of the county is located in the 100-year floodplain, including nearly 7,000 structures valued at more than $2.3 billion (OCMJHMP 2009). Six flood damage impact areas have been identified in the county and within those areas are 188 repetitive loss properties and 4 severe repetitive loss properties, with annualized losses estimated at nearly $400,000 (OCMJHMP 2009). Onslow County’s low-lying topography, abundance of water, and socio-economic characteristics make it particularly vulnerable to damage from hurricanes and flooding events, which makes mitigation planning essential for future resilience.

IV.2. Planning Outputs: Hazard Mitigation Plan Quality

Onslow County’s current hazard mitigation plan was adopted in 2010. The main body of the hazard mitigation plan is a 150-page document laying out a detailed fact base and a broad array of mitigation strategies and policies.³ While numerous tables and nearly a dozen maps supplement the main text, the narrative of the plan is choppy with extensive bulleted and fragmented sections that make it cumbersome to read in places. The plan goes above and beyond basic FEMA requirements, but is not well crafted for an audience beyond core stakeholders and state and federal mitigation officials.

² This dissertation focuses on the period prior to Hurricane Irene in August 2011.

³ It also includes five shorter annexes for each of the municipalities in the county.
Figure IV.1: Map of Onslow County Showing Flood Hazard Zones (OCMJHMP 2010, page 125)
Overall, the Onslow County Hazard Mitigation Plan promotes land use approaches as a central part of its past and future mitigation strategy. The plan’s narrative summary of the mitigation strategy includes strong statements for taking a land use planning-oriented approach to hazard mitigation, including:

“When land use planning for hazards is not incorporated into a hazard mitigation plan, risk reduction measures may also be used as a way to develop hazard prone areas for short term economic gain instead of steering development to safer areas. Planning is key to making mitigation a proactive rather than reactive process and to ensuring that land subject to hazards is identified and managed appropriately to reduce future exposure” (OCMJHMP 2010, page 15).

The plan also describes an idealized purpose for the mitigation planning process with an important land use component: it “serves to publicize hazard information and create a forum for discussion of how to best to balance the public interest and private property rights” (OCMJHMP 2010, page 15).

IV.2.a. Fact Base Principle: Capability Assessment

The Onslow County hazard mitigation plan capability assessment explains the broad scope of capabilities needed for effective mitigation and provides detailed, Onslow-County specific land use-related information. At the same time, the material does not form a cohesive and clear summary because it is scattered across multiple sections of the plan. Altogether, the capability assessment is highly detailed yet also disjointed, which creates an impressionistic picture, rather than a clear understanding, of mitigation-related land use capabilities in the county.

A stand-alone, thirteen page, Capability Assessment section is included as an appendix to the main body of the plan. Most of the material, which includes legal capabilities (e.g. regulatory powers), institutional capability (i.e. staffing), political capabilities, fiscal capabilities, and technical capabilities, is generic to any county in North Carolina. Meanwhile, most of the Onslow County-specific capability assessment is included in the mitigation strategy. A bulleted list catalogues the

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4 Interestingly, sections of the legal capability review are identical in the Onslow County, Beaufort County, Carteret County, Craven County, and Hertford County hazard mitigation plans. The Beaufort, Carteret, Craven and Hertford County plans all indicate Holland Consulting Partners as the preparer of the plan. Emergency Services officials said Holland Consulting Partners was not the consultant for the Onslow County plan, however.
purposes of six plans, ordinances, and programs.\(^5\) Policies from the CAMA Land Use Plan related to Storm Hazard Mitigation, Post-Disaster Recovery, and Evacuation Plans are listed as well, albeit in a choppy, cut-and-paste manner.

Further muddying the picture is the inclusion of two worksheets – titled Community Capability Assessment and Community Goals – included after the appendixes to the plan. The worksheets excerpt policies and goal statements from the Comprehensive Plan and the Flood Damage Prevention Ordinance. No explanation is given whether this plan and ordinance are the same as or different than the CAMA Land Use Plan or the Floodplain Management Ordinance. As it turns out, for about a decade Onslow County had a separate 1997 Coastal Area Management Act (CAMA) Land Use Plan and a 2003 Citizen’s Comprehensive Plan and there was no clear precedence of one over the other. Over roughly the same time period that the 2009 hazard mitigation plan was updated, the CAMA and comprehensive plans were combined into 2009 Onslow County Comprehensive Plan: CAMA Core Land Use Plan (OCCP 2009). The hazard mitigation plan makes no mention of the distinctions between the two plans or the effort to consolidate them.

Onslow County’s inclusion of detailed land use-related information in its capability assessment points to coastal North Carolina’s history dating back to the 1970s of encouraging integration of planning for land use, hazards, and environmental management through CAMA Land Use plans. Yet, in spite of the specific detail presented in this section, an overall picture of how the county’s mitigation capabilities interrelate fails to emerge. Perhaps the biggest weakness of the capability assessment is that its disorganization precludes analysis of the gaps in existing capabilities that the mitigation strategy could be designed to address. A paragraph in the introduction, headed “Interim Conclusions,” mentions that the capability assessment has been combined with the hazard identification and vulnerability assessment sections of the fact base to inform the proposed strategies,

\(^5\) These include the Emergency Operations Plan, the Coastal Area Management Act (CAMA) Land Use Plan, and the Onslow County Hurricane Plan, the Floodplain Management Ordinance, the North Carolina State Building Code, and the Community Rating System Program.
polices and actions. It does not explain how the information were combined and analyzed, however, nor does it delineate the conclusions (i.e. gaps in existing capabilities) of the analysis. 6

While the plan includes important spatially specific land use-related information in the type of maps that are missing in many other mitigation plans (see Figure IV.1), opportunities are missed to clarify the linkages between existing land uses and zoning, hazard risks, and future policy directions. Detailed maps identify existing land use and zoning classifications throughout the county, which are then overlaid with hazardous areas. For the zoning map the legend only includes abbreviations for more than 70 different types of zones and lacks essential detail for interpreting the maps’ implications. For the map of land use zones the scale is so broad that interpretation of where land uses and hazard exposure conflict is very difficult. Also limiting the value of the land use and zoning maps is a lack of narrative summaries of the maps, which could be used to evaluate the effectiveness of existing policies and programs and establish an analytical foundation for justifying the suite of policies proposed in the mitigation strategy.

Interviews with key stakeholders help fill in the gaps in analysis of the relationship between land use and hazards for the purposes of this case study. In spite of the CAMA Land Use planning tradition, Onslow County’s approach to land use regulation was very permissive and, in practice, often failed to shift development away from known hazard areas. Historically, the county’s political culture has been very pro-growth and against regulations that might limit private property rights. Countywide zoning was not adopted until the early 2000s and in 2011 efforts were underway to develop a unified development ordinance to reduce fragmentation across other ordinances (e.g. mobile home park ordinance and flood damage prevention ordinance) and eliminate conflicts. Also, conflicts existed between the CAMA Land Use plan and zoning ordinances, in part because political

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6 A three-paragraph “Analysis of Capability” at the end of the stand-alone capability assessment section reviews the purpose of a capability assessment in general terms and succinctly notes that Onslow County’s capability assessment shows the commitment of the county to mitigation.
necessity required compromises just to get the zoning ordinance approved.\textsuperscript{7} When attempting to create or strengthen existing land use regulations, local planners have had to take what one termed “baby steps.” During a recent update of the subdivision ordinance, efforts to strengthen the regulations (e.g. prohibiting construction of a new street in a floodplain) failed. In Onslow County adopting more than the minimum state and federal standards for land use approaches to mitigation takes considerable patience and effort on the part of local planners and other mitigation stakeholders in this county where ‘developer’s choice’ is the status quo.

\textit{IV.2.b. Policies Principle: Mitigation Strategy}

The core of Onslow County’s future-oriented mitigation strategy is a set of 25 “strategies” complemented by an amalgam of other ongoing “projects, plans and other ordinances.” Most of the strategies focus on continuing and strengthening its current efforts related to educating the public, creating and maintaining access to data, and carrying out emergency operations. Two strategies primarily relate to land use approaches to mitigation. First, Strategy #8 in the plan indicates “Onslow County will rely on its existing ordinances and land use controls to regulate development within the floodplain. These documents will be periodically reviewed and updated” (OCMJHMP 2010, page 25). This action is a top priority, though it lacks specificity about how the documents will be relied upon or how they will be reviewed and updated. Second, Strategy #18 involves adopting “a policy to prohibit development of critical public facilities in the 100-year floodplain where viable alternatives exist,” which it notes could be enforced through the floodplain and subdivision regulation ordinances and the process of issuing permits (OCMJHMP 2010, page 26). This action is a secondary priority and lacks specificity about what is meant by ‘viable alternatives.’ Additional strategies reinforce the two primary land use-oriented strategies.\textsuperscript{8}

\textsuperscript{7} For example, areas of the county designated as agricultural land use districts in the land use plan were in a rural zoning district that allows development of brand new subdivisions.

\textsuperscript{8} These include continuing to support implementation of storm hazard mitigation policies (e.g. sheltering, building codes, evacuation, and post-disaster redevelopment) in the county’s CAMA Land Use Plan and maintaining data for GIS analysis.
The ongoing projects, plans and ordinances presented as part of the county’s mitigation strategy largely correspond to the ‘strategies’ described above.\(^9\) For example, the mitigation plan references CAMA Land Use Plan policies that address storm hazard mitigation, post-disaster recovery, and evacuation. The plan notes that “[W]hen reviewing development proposals, the County will work to reduce density in areas susceptible to flooding. In addition the County will encourage public purchase of land in the most hazardous areas” (OCMJHMP 2010, p. 36). The plan also identifies the three highest priority ‘projects’ for the 2010-2015 period. Those three projects include 1) becoming a participating jurisdiction in the NFIP Community Rating Service program, 2) developing information about sinkhole hazards, and 3) identifying alternative water systems for emergency purposes, none of which are closely tied to using land use approaches to reduce hazard risks. Notably, few discrete ‘shovel-ready’ projects (e.g. retrofitting of public facilities, storm water controls, etc.) are included in the mix.

Clearly, Onslow County positions land use approaches as a key part of its ongoing hazard mitigation strategy alongside public education and emergency services efforts. While the land use-related approaches focus on continuing implementation of – rather strengthening or supplementing – existing plans and policies, they represent a robust effort to integrate land use into hazard mitigation. The plan misses opportunities to promote more aggressive land use regulations, though. Emergency Services officials indicated that they intended for policies in the mitigation plan to help reinforce and drive land use policies by providing a rationale for managing development in hazardous areas. They also indicated that they want to work more closely with the Planning and Development department in the future. The broad combination of regulatory and programmatic approaches in the Onslow County plan reflects the flexible approach to promoting local mitigation planning taken by the State of North Carolina.

They also include acquiring hazard-prone properties and prevention of subsequent development of those parcels, encouraging local surveyors, engineers and planner to learn about National Flood Insurance Program land use and building standards, and applying for Community Rating System classification.

\(^9\) These include the Floodplain Management Ordinance, the Community Rating System, the North Carolina State Building Code, the county Emergency Operations Plan, the Coastal Area Management Act Land Use Plan and its policies.
Carolina. However, one potential downside in the flexible approach can be seen in the fact that Onslow County has opted to have many of the future-oriented aspects of its plan simply consist of continued implementation of permissive land use regulations rather than striving for substantial policy changes.

**IV.2.c. Implementation Principle: Implementation Information**

Information about how land use approaches to mitigation will be implemented is limited and vague in the Onslow County hazard mitigation plan, likely attributable to the fact that the land use-oriented proposed strategies and actions consist of continuation of existing programs and efforts (see Figure IV.2 for examples). Strategy #8 is listed as the responsibility of the Community Development Coordinator in the planning department and Strategy #18 is listed as the responsibility of the County Manager. The additional strategies that support land use approaches are assigned to the Community Development Coordinator and the Board of Commissioners.

**Figure IV.2: Examples of Mitigation Strategies and Associated Implementation Information**

(OCMJHMP 2010, page 24)

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Mitigation Strategy</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Develop, enhance, and implement education programs aimed at mitigating natural hazards, and reducing the risk to citizens, public agencies, private property owners, businesses, and schools. (Community Development Coordinator; Ongoing)</td>
<td>A</td>
</tr>
<tr>
<td>2</td>
<td>Onslow County will continue to support its <em>Emergency Operations Plan (EOP).</em> This plan includes evacuation procedures and response to hazards not addressed in this plan such as hazardous materials, petroleum products, hazardous waste, nuclear threat/attack, and civil disorder. (Board of Commissioners; Ongoing)</td>
<td>A</td>
</tr>
<tr>
<td>3</td>
<td>Onslow County will continue to support its storm hazard mitigation policies provided in the 1997 Onslow County Coastal Area Management Act (CAMA) Land Use Plan. (Board of Commissioners; Ongoing)</td>
<td>A</td>
</tr>
<tr>
<td>4</td>
<td>Onslow County will maintain floodplain, parcel data and aerial photographs in digital format. The County should be capable of overlaying these overages on its geographic information system (GIS). (Community Development Coordinator; Ongoing)</td>
<td>B</td>
</tr>
</tbody>
</table>
Assignment of specific responsibilities to a planning-oriented official, the highest-ranked county administrator, and elected officials point to the expectation of commitment to implementation of the hazard mitigation plan in the county. The timeline for both strategies is “ongoing.” While an “ongoing” timeframe fits with the phrasing of the strategies as essentially continuing existing efforts, it is vague and provides no indication if and how modifications to the strategy might need to be made over time. Additionally, no sense of the cost, even in terms of the number of staff required, is provided.\textsuperscript{10}

The mitigation plan states that the OCMJHMP will be incorporated into updates of other planning documents, including the CAMA Land Use Plan, as well as floodplain, subdivision, and zoning ordinances. The only specific task related to incorporation is that “the local planner will provide a copy of the hazard mitigation plan to each respective advisory committee member” (OCMJHMP 2009, page 46). More generally, the “local planner” will recommend that committee members ensure that other local plans are consistent with the hazard mitigation plan. It is unclear which local official the term “local planner” refers to, leaving responsibility for ongoing integration uncertain.

\textbf{IV.3. Planning Outputs: Implementation of Land Use Approaches to Mitigation}

Ongoing implementation of land use approaches to mitigate hazards in Onslow County consists of enforcement of existing regulations that do not aggressively limit development in hazardous areas. This set of implementation efforts corresponds to the strategies, policies and programs included in the plan, the majority of which focused on continuing existing efforts. The first of the primarily land use-oriented strategies (Strategy #8) – ongoing enforcement and periodic review and update of floodplain development regulations) – is the main job responsibility of the floodplain manager. The Flood Damage Prevention Ordinance will be updated along with the flood maps before the next hazard mitigation plan update in 2014-2015. The other primarily land use-oriented strategy

\textsuperscript{10} For the other projects, plans, and ordinances identified for implementation in plan, the information about how they will be implemented consists of passing references to responsible county agencies.
(Strategy #18) – adopt a policy prohibiting development of critical facilities in hazardous areas – was adopted in the 2005 Flood Damage Prevention Ordinance, prior to the development of the 2009 mitigation plan.\textsuperscript{11} Interviewees indicated that land use-related strategies that consist of continuing efforts that predate the 2009 plan (e.g. publicizing NFIP land use and building standards, requiring free-board elevation of properties, and supporting storm policies in the CAMA land use plan) are being implemented. Meanwhile, land use-related strategies that involve new action, funding, or political commitment (e.g. acquiring properties in hazardous areas or applying for Community Rating System classification) have not been implemented. Thus, in terms of evaluating plan conformance (i.e. progress on implementing specific actions in the plan) for land use approaches to mitigation, implementation success was high for continuation of pre-existing efforts but low for new initiatives.

Implementation efforts were generally stove-piped by jurisdiction and, within the county, by agency. Jacksonville carried out storm water projects using local funding and some residents have elevated their homes using their own funds. North Topsail Beach continued to enforce a wide variety of land use related approaches to mitigation from its CAMA Land Use plan that are specific to the unique barrier island conditions it faced.\textsuperscript{12} At the county level implementation efforts were limited. The floodplain manager participated in the Technical Review Committee for development proposals, but otherwise did not engage in land use approaches to mitigation. A county land use planner indicated little familiarity with the strategies included in the mitigation plan. The main exception to the isolated efforts to implementation appeared to have been the GIS department’s efforts to maintain and update data and maps, which the floodplain and emergency services officials noted they rely heavily upon.

\textsuperscript{11} The county appears not to have followed its own policies, however. According to one stakeholder a new $50+ million jail facility in downtown Jacksonville was recently built in the 100-year floodplain. Concerns about flooding at the site were ignored because local power brokers wanted the downtown site. As a result the Information Technology facilities had to be located on the second floor, although the stakeholder noted that the generator powering those IT facilities is on the ground floor and is vulnerable to flooding.

\textsuperscript{12} Included in North Topsail Beach’s ongoing efforts is the attempt to have Congress remove its Coastal Barrier Resources Act designation. As noted earlier, this ongoing effort would be a fascinating case in its own right because of the intimate link between land use and hazard vulnerability it entails, as Salvesen (2005) has explored. Doing so is beyond the scope of this dissertation.
In line with the efforts described above, responses from Advisory Committee members indicate moderate levels of use of generic land use approaches— not limited to implementation of the mitigation plan— in their ongoing work in 2011 (Table IV.1). High proportions of members working to limit development in hazardous areas points to widespread recognition of the link between land use and vulnerability, although the limited efforts on setbacks and buffers suggests room for improvement in making linkages between environmental conservation and reduced vulnerability. That efforts to implement funding-driven approaches (i.e. acquisition) were limited is not surprising in absence of federal post-disaster funding in tight economic times. Efforts to incorporate the mitigation plan into other initiatives and ongoing modeling and analysis point to ongoing efforts to maintain or build capacities related to using land use approaches to mitigation hazards.

Table IV.1. Committee Members’ Self-Reported Efforts to Implement Land Use Actions

<table>
<thead>
<tr>
<th>Land Use Action Type</th>
<th>Percent of Committee Members Reporting Effort (Number reporting/total respondents)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limit development in hazardous areas</td>
<td>71% (5/7)</td>
</tr>
<tr>
<td>Setbacks, buffers and regulations to protect natural mitigation features</td>
<td>29% (2/7)</td>
</tr>
<tr>
<td>Elevating or Acquiring Properties</td>
<td>29% (2/7)</td>
</tr>
<tr>
<td>Acquire land to protect natural mitigation features</td>
<td>14% (1/7)</td>
</tr>
<tr>
<td>Incorporate hazard mitigation plan into other planning initiatives</td>
<td>43% (3/7)</td>
</tr>
<tr>
<td>Land use modeling and/or analysis</td>
<td>57% (4/7)</td>
</tr>
</tbody>
</table>

The biggest challenges to implementation cited by Onslow County stakeholders were access to funding and the local political culture. After the hurricanes of the 1990s there was federal funding available for buyouts, elevations and other mitigation projects. Since then, a lack of funding has constrained the ability of stakeholders to work with individual property owners in hazardous areas to
protect existing structures or purchase land for conservation and mitigation purposes. In regards to policy and programmatic-oriented approaches, the challenges cited by stakeholders related to the local political culture. Stakeholders described the overall public apathy around hazard mitigation issues and prioritization of short-term individual property rights over the general public welfare and, in some cases long-term individual welfare. The overarching challenge expressed by Emergency Services officials was the need to move the county from a reactive to proactive mindset.

IV.4. Hazard Mitigation Plan Development and Update Process

Following a thirty to forty year lull in major hurricanes, the barrage of hurricanes in the mid-1990s dramatically increased attention to emergency planning of all types in Onslow County. Characteristics of the process of developing the plan in 2004 and changes in the process used to update it in 2009 help explain the disjointed treatment of land use in the plan, especially in the capability assessment.

In the early 2000s, Onslow County received federal planning grant support and employed an independent consultant to develop its 2004 Multi-Jurisdictional Hazard Mitigation Plan, which covers the county and the five municipalities, but not military-owned areas. Emergency Services staff were unsatisfied with the consultant’s work noting it “was not driven enough by the needs of the county … more driven by getting the product done.” In particular, the consultant lacked familiarity with “the day-to-day issues we deal with” and was “not vested in the plan.”

The 2004 plan was used as the template for the 2009 update. In contrast to the 2004 plan, the 2009 plan was developed entirely by county staff, with a college intern in the Emergency Services agency taking lead responsibility. Using an intern in this way allowed the county to get much of the work of developing the plan done for free and, as it turned out, build organizational capacity because the intern has been promoted through the ranks and is now in a management position in the agency. At the time, though, the intern brought limited experience with land use planning in general and Onslow County’s development management program specifically. Together, the consultant’s template and the intern’s limited experience help explain why the capability assessment provides a
muddled picture of existing capabilities to reduce hazard risks through land use approaches. Another important factor in the unclear picture of capabilities is the fact that it appears summarizing them would require someone very familiar with them because of the disconnected history of the CAMA Land Use Plan and Citizens Comprehensive Plan.

The process of updating the plan in 2009 involved a countywide Hazard Mitigation Plan Update Advisory Committee, made up of 10 representatives from local governments in the county (OCMJHMP 2009). Although no representatives from the county Planning and Development department were included on the list of committee members in the plan, interviews indicated that the floodplain manager, who works in the Code Enforcement division of county Planning and Development, should have been included on that list.\footnote{The emergency services officials indicated that the failure to include the floodplain manager was a “typo” and the floodplain manager confirmed her participation on the committee.} North Topsail Beach’s town planner served as its representative. Additionally, municipal-level advisory committees were used to update five municipal annexes appended to the countywide plan.

The county-level Advisory Committee first met to update the plan in February 2009 and in the summer of 2009 the municipal advisory committees worked individually to update their annexes. Participation of Advisory Committee members in the 2009 update process tended to be quite frequent.\footnote{Responses to the survey administrated for this dissertation indicate that four committee members were heavily involved, participating on a daily basis or a few times a week, while two members reported participating less than once a month.} Participation among city and town officials in the municipal annex updates varied from municipality to municipality. For example, in North Topsail Beach, in which dealing with flooding, beach erosion, and land use regulation has been very prevalent,\footnote{Although a detailed review of the intersection of land use and hazards in North Topsail Beach is beyond the scope of this case study, is a fascinating case study in its own right. Much of the town is affected by the Coastal Barrier Resources Act (CBRA), which restricts federal investment (including providing federal flood insurance). Interviewees indicated insurance rates can be an order of magnitude higher in the CBRA zones than just over the line outside the CBRA zone. In turn, home and land values are much lower in the CBRA zones. In recent years, the town has been lobbying Congress to remove the town lands from the CBRA zone.} the town planner engaged the
planning commission and described its members as being quite involved. Meanwhile, in Jacksonville the fire department, which handles emergency management, engaged its public works (e.g. engineering and storm water) and building inspections staff. Jacksonville officials noted the planning process has increased awareness of mitigation among staff, but it remains “difficult to sit them down” and the other agencies often send substitute representatives. More generally, interviewees noted that public interest in hazard mitigation planning, and planning issues more broadly, was generally low in the County.  

IV.5. Hazard Mitigation Stakeholder Network Diversity

Surveys of seven of the nine steering committee members from the 2009 planning process who are still in the mitigation network enabled further exploration of the relationship between the diversity of stakeholders in the mitigation network, including the assets they brought to the planning process, and mitigation planning outputs. This analysis indicates that a wide variety of planning-related skills were embedded in the network, even though only one committee member brought a land use planning background. The Advisory Committee included two officials from the county emergency services department, one from the county GIS department, one from the county manager’s office, two from Jacksonville, and one each from the other four municipalities. Among committee members who responded to the survey, three listed in the plan described their professional expertise emergency management backgrounds, one indicated a land use planning background, one GIS, one 

Meanwhile, much of North Topsail Beach is experiencing high erosion rates (2 to 3 feet or more per year in places) and in places dunes are non-existent or have eroded into the pilings of beachfront homes, raising questions of whether it is advisable to use federal subsidies to make development more cost beneficial in the town.

16 In late summer and early fall 2009 two tracks of public involvement were undertaken. First, each of the five municipalities held a public hearing so that residents would be able to focus on the highly localized issues in their own areas, although attendance was very low. Second, a subsequent countywide public hearing was held with county emergency services department officials available to answer questions. No public comments were received at the countywide public hearing. The plan update was approved by the county Board of Commissioners in August 2010.

17 While the military is a major stakeholder in the county, the Marine Corps base was not represented on the Advisory Committee and has its own separate hazard mitigation plan, leaving a large blank space – literally and figuratively – in the county’s mitigation planning.
business, and one municipal administration. Interviews corroborate the survey findings and, as noted above, the county’s floodplain manager was also involved on the committee. The floodplain manager’s background was in emergency management and building code enforcement, not land use planning. Thus, as was the case with the intern’s background, the other committee members brought limited land use experience to the planning process, which constrained their ability to generate a detailed and well-organized assessment of land use capabilities.

Although the committee was relatively small and there were not multiple planners involved, committee members do bring considerable experience with hazard mitigation in general and some land use-related skills to the mitigation stakeholder network. In terms of individual members’ experience with hazard mitigation, three members indicated more than ten years experience, one indicated six-to-ten years experience, and three members indicated less than five years experience. In terms of skills related to developing a plan, four of seven respondents indicated skills in outreach and communications and five indicated skills in facilitation, mediation and conflict resolution. These generic plan making assets contributed to the solid quality of the plan overall.

Meanwhile, the committee brought a moderate amount of land use related assets. Two members – including the county GIS department – indicated bringing analytical technical skills such as GIS and HAZUS, which explains the relatively detailed maps in the plan. Skills related to ongoing plan implementation were somewhat limited, as two respondents indicated skills in regulation drafting and interpreting, three indicated skills in plan and site review, and one indicated having rule-making authority. Two respondents indicated bringing authority for budgeting and one indicated authority to distribute funds for mitigation projects.

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18 The floodplain manager was not included in the survey because it did not become clear until the interviews – conducted after the survey was closed – that she was on the committee but mistakenly left out of the plan.

19 Seven of the ten Advisory Committee members identified in the plan completed the survey, including all the county officials and three of the six municipal officials. The process of administering the survey identified one of the Advisory Committee members as having left the network since the plan update process. The town manager of Holly Ridge is no longer in that position, indicating that 90% of the Advisory Committee members appear to still be part of the broader hazard mitigation network.
Another important asset for integrating land use approaches into mitigation is favorable views among stakeholders about the effectiveness of preventative land use approaches to mitigation. As seen in Table IV.2, Onslow County stakeholders indicated strong favorable views of preventative land use approaches and natural resource protection approaches (e.g. wetland conservation), along with Emergency Services approaches. These views fit with North Carolina’s efforts to foster a mixture of project and regulatory approaches to mitigation.

**Table IV.2 Onslow County Stakeholder Views on Effectiveness of Mitigation Approaches**

<table>
<thead>
<tr>
<th>Mitigation Approach</th>
<th>Mean Score *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property Protection</td>
<td>3.9</td>
</tr>
<tr>
<td>Information</td>
<td>3.6</td>
</tr>
<tr>
<td>Preventative Land Use</td>
<td>4.6</td>
</tr>
<tr>
<td>Emergency Services</td>
<td>4.6</td>
</tr>
<tr>
<td>Structural Controls</td>
<td>3.3</td>
</tr>
<tr>
<td>Natural Resource Protection</td>
<td>4.4</td>
</tr>
</tbody>
</table>

* n = 7
* 5.0 Very effective to 1.0 Very Ineffective

**IV.6. Hazard Mitigation Stakeholder Network Structure**

Close examination of the mitigation stakeholder network to determine the patterns of relationships between stakeholders provides additional explanations of incorporation of land use approaches in the plan. Overall, the Onslow County mitigation stakeholder network had a small, occasionally active, opinion leader structure that recently experienced staff turnover in many key stakeholder organizations. The most important stakeholders – the ‘opinion leaders’ – were the Emergency Services agency representatives, one of whom expressed a view of mitigation planning primarily as a data-gathering exercise centered on a technician mostly working alone to write the document. These attributes of the network provided a solid foundation for compiling information for inclusion of information in the plan. They were less supportive of the types of relationships needed to facilitate discourse needed to identify problems in existing land use patterns and policies and collaborate to develop and implement a plan that moves beyond a business-as-usual approach to mitigation.
The network of stakeholders sharing information is relatively small, with 19 organizations total in the network, of which 9 were represented on the Advisory Committee. Its star-shaped, opinion leader structure is evident in Figure IV.3, which shows almost all connections in the network flowing to the organization at the center and few connections between peripheral stakeholders (i.e. peripheral attachment). Stakeholders indicated that activity in the hazard mitigation network fluctuated over time. During the plan update process in 2009 there was regular interaction on mitigation issues, but in between plan updates activity has been limited to an annual meeting. An exception to this pattern would be when funding became available and activity would increase because, as one stakeholder said, “money drives everything.”

The central position of the county Emergency Services agency (the triangle in the center labeled “A”) is clear in Figure IV.3. It was directly connected to 83% of the other organizations in the network and had the highest betweenness centrality score. Stakeholders confirmed the key coordination role filled by Emergency Services staff as the core stakeholder network. They also described the key bridging role Emergency Services staff filled in facilitating connections to state and federal emergency management agencies to ensure that the county and municipalities maintained compliance with the state and federal mitigation planning requirements.

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20 The stakeholders identified in the survey but not represented on the Advisory Committee largely correspond to a list of additional stakeholders who were described in the plan document as having been involved in a limited, consultative manner during the 2009 update process.

21 The degree centrality of the Emergency Services agency was 15 (i.e. connections to fifteen other stakeholder organizations), while the next closest degree centrality was 4. Its betweenness centrality score was 145, which is difficult to interpret in isolation; the next closest score was 45.

22 Municipalities generally deal directly with the state and federal emergency agencies in developing and submitting grant applications, however.
Figure IV.3: Onslow County Information Sharing Network
The peripheral stakeholders representing the five municipalities and county agencies reported few connections to each other on mitigation issues in their survey responses, although they described themselves as filling other bridging roles in interviews. For example, as noted above, the North Topsail Beach planner (represented by a diamond labeled “B”23) served as the key bridge between the county Emergency Services agency and the town manager, plan commissionners, fire chief and town officials engaged in the town’s update to its annex to the mitigation plan (those agencies are not represented on Figure IV.3). Similarly, the Jacksonville Fire Department (the circle labeled “C”) served as the bridge between the Jacksonville-specific stakeholders engaged in its annex update (not represented on Figure IV.3) and county Emergency Services. On the other hand, none of the stakeholders described bridging connections between the municipalities themselves. Instead, one stakeholder described connections between municipalities as “virtually non-existent,” citing the limited staff capacity of the small towns in the county as a major reason for the lack of collaboration. In terms of the peripheral county agencies, Emergency Services officials reported especially strong ties with the GIS department (the circle labeled “D”) because of data and analysis services it provides on multiple emergency management issues. The Deputy County Manager (the circle labeled “E”) reported links to the county Solid Waste and Soil and Water Conservation departments.

A major challenge to hazard mitigation efforts over the last few years has been turn over in county leadership positions. For example, in a two to three-year period, an Emergency Services director left and was replaced for a year by an interim director until a new director was hired. The new director held the position for a short time and ended up being replaced by the person who had previously served as interim director. In this seesaw time of three different directors and four transitions, there was also a loss of staff and a reorganization within the agency. Meanwhile, multiple other department heads in the county left or retired and a new Assistant County Manager came in as well. All of this flux resulted in some efforts, including hazard mitigation, being temporarily de-

23 Since neither planning agency (triangles) reported a connection, it would be totally arbitrary to distinguish between their positions in the network diagram.
prioritized. The lower priority placed on hazard mitigation planning is another factor that helps explain why the mitigation plan focused on business-as-usual approaches because taking a more pro-active and aggressive land use approach to mitigation would have required more time, attention and effort than was available at the time. Likewise, the observed lack of implementation of the adopted mitigation plan can be attributed to the de-prioritization of mitigation during the transition period.

The Emergency Services agency reorganization did result in the creation of a new planning officer position that is highly valued by agency management. The position is conceived around a planner as a technician writing plans rather than a facilitator or mediator fostering collaboration among stakeholders. This view is reflected in a statement by an Emergency Services official: “I don’t know how any emergency management organization can really operate without a true planner … who can sit down with the document, close the door, shut the rest of the world out, read through it and find out the major parts that need to be pulled from and write.” This supportive, but technocratic view of the process of planning in the Emergency Services agency merits attention because in an opinion leader network the views of the central stakeholder can easily dominate because other stakeholders are isolated from each other.

In contrast to the small and generally inactive hazard mitigation network, Onslow County had other, larger and more active emergency management and planning-related networks that at least partially overlap with the mitigation network. Most prominently, the emergency preparedness and response network involved with the Emergency Operations Center included more than 70 local stakeholders, many of whom were also part of the 10 to 15 people involved in the mitigation network. Meanwhile, the Planning and Development department had a Technical Review Committee that met monthly to review major development proposals and special use permits. Some of its members, such as the floodplain administrator and GIS department, were involved in hazard mitigation planning also, although Emergency Services involvement recently stopped, as described in more detail below.
IV.7. Bridging the Emergency Management – Land Use Planning Expertise Boundary

As the previous sections have shown, the emergency management – land use planning expertise boundary has been bridged in multiple ways in Onslow County, but those ties have been weak and unstable. On the Advisory Committee, the most obvious bridge across this expertise boundary was between the county Emergency Services representatives and the North Topsail Beach town planner, who also served as the town’s floodplain administrator and coordinator of its municipal mitigation advisory committee. However, interviews indicated that North Topsail Beach handled most of its hazard mitigation and land use planning in isolation from the county and that ties across the expertise boundary were direct but weak. In, Jacksonville, the largest city in the county, the planning department has not been involved in mitigation planning efforts.

At the county level, Emergency Services officials reported active engagement of county planning representatives (the diamond labeled “F” on Figure IV.3). They noted the inclusion of the floodplain manager on the Advisory Committee and indicated that the director of the Planning and Development department participated in the 2009 update process. However, that director subsequently left and the position was vacant for nearly a year – one of the many transitions in personnel during that period.

Considering the expertise boundary from the other side, the floodplain manager position was in the Planning and Development department, but as noted earlier the person in the position had more of an emergency management than land use background. The floodplain manager reported working closely with others in the Code Enforcement and Permitting division and surveyors, developers, and builders involved on ensuring that buildings were constructed in compliance with the Flood Damage Prevention Ordinance.24 In terms of land use, though, other than serving on the Technical Review Committee (TRC), the floodplain manager reported less frequent collaboration with the Land Use

24 The emphasized that in Onslow County the Floodplain Damage Prevention Ordinance has been more of a building code issue with limited site-specific land use issues such as grading, filling and paving than a land use planning tool.
division of the Planning and Development department, which is responsible for zoning, subdivision regulation and comprehensive planning.\textsuperscript{25} Thus, the nominal Planning and Development department representative on the advisory committee was not a land use-oriented planner so much as an emergency management-oriented code enforcement official.

Involvement in mitigation planning by the Land Use division of the Planning and Development department was limited to providing background information but not attending meetings or actively participating. Echoing the challenges related to staff turnover described by Emergency Services officials, a Planning and Zoning official noted that a key bridge to the Emergency Services agency was lost recently when the Fire Marshall, who was present at monthly the monthly TRC meetings, was moved to the Sheriff’s office. More broadly, the Land Use division has irregular contacts with Emergency Services as issues arise and participates in the Emergency Operations Center when there is a disaster event.\textsuperscript{26}

Altogether, ties between county emergency managers and land use planners have existed, but they were weak, indirect, or lost through staff changes. For the most part emergency managers and planners work in their own separate disciplinary silos, which helps explain multiple shortcomings in the integration of land use into the mitigation plan touched on throughout this case. Presumably, stronger ties between emergency managers and local planners would have helped the intern clarify the existing land use capabilities, prompted the Advisory Committee to brainstorm ideas about how the mitigation plan could be more effectively used to promote more stringent land use regulations in hazardous areas that move beyond business-as-usual, and allowed all the stakeholders to chart out a much clearer path for integration the mitigation plan into other planning efforts.

Interestingly, the lack of strong ties between emergency managers and land use planners may be due in part to an underlying desire among emergency managers to avoid politicization of hazard

\textsuperscript{25} The floodplain manager was not involved in developing the North Carolina Coastal Area Management Act Land Use Plan, which serves as the county’s comprehensive land use plan.

\textsuperscript{26} Ties between the Jacksonville planning and county planning departments were described as weak as well.
mitigation. Emergency Services officials emphasized that their main responsibility was public safety and they need to focus on protecting residents. They expressed concern that involving a broader range of stakeholder in the mitigation process – especially stakeholders engaged in land development – would introduce zoning, subdivision, code enforcement and related conflicts over balancing regulation for the public welfare and property rights into mitigation planning. They feared that these conflicts would distract from their ability to engage in other pressing mitigation efforts. The Emergency Services officials pointed to the Planning and Development department and the planning board as entities set up to handle decisions related to land use and code enforcement. They noted that planners involved in hazard mitigation could raise land use related issues from other planning processes at mitigation meetings. This perspective reflects a view of local planners as valuable buffers against politicization of emergency management issues. Yet, it also reflects a quandary because if hazard mitigation is intentionally depoliticized then it is also marginalized in land use decision making processes that have tremendous impacts on hazard vulnerabilities and losses.

IV.8. Summary

Pro-development Onslow County experienced a series of major hurricanes in the mid-1990s that resulted in massive property damage and economic losses. Those events and passage of the Disaster Mitigation Act prompted increased attention to hazard mitigation, including how development patterns and land use regulations factor into the equation of reducing hazard risks. The star-shaped, opinion leader network of mitigation stakeholders centered on the county Emergency Services agency has been negatively impacted by a series of transitions among key county officials. In the wake of these transitions, local emergency managers have built internal capacity to conduct emergency planning and have important, although weak and indirect ties, with land use planners. Overall, the county’s hazard mitigation plan is broad in scope, contains detailed information, tables, and maps, yet it is somewhat disorganized and cumbersome to read. Land use considerations are evident throughout the plan, including in the future-oriented mitigation strategy, but mainly consist of continued implementation of weak policies and ordinances.
This case study points to the influence of three main sets of factors on hazard mitigation planning and the use of land use approaches to mitigation. First, the influence of the flexible approach taken by the State of North Carolina in its responsibilities for coordinating local planning are reflected in the inclusion of policy (e.g. land use regulation), programmatic (e.g. education programs), and project-oriented (e.g. stormwater projects) approaches in Onslow County and its municipal partners’ mitigation strategies. Moreover, the document organizes and coordinates ongoing policy and program implementation more than it creates a long wish list of good ideas for spending external mitigation dollars. While this approach helped the county connect mitigation planning to other integrative planning efforts such as comprehensive planning, it may have the downside of leaving Onslow County and its municipal partners unprepared to negotiate state and federal post-disaster grant application processes in the event of a major disaster in the future.

Second, the star-shaped, opinion leader structure and overall instability of the stakeholder network appear to have negatively impacted the quality of the mitigation plan and ongoing implementation efforts. A star-shaped network worked well for efficiently consolidating information from disparate municipal and county stakeholders to the Emergency Services intern for compilation and summary. Yet, a consequence of this approach was missed opportunities to foster more extensive discourse among the full set of stakeholders about how to strengthen and extend their mitigation efforts – just the type of discourse idealized in the beginning of the plan document. Another way in which this approach fell apart was that the intern, or the consultant used previously, appeared to have had limited experience with the land use related policies being integrated into the plan. Stronger ties between emergency managers and land use planners and more active involvement of land use planners in the planning process might have helped strengthen the capability assessment and set the stage for a more innovative mitigation strategy.

Turnover in Emergency Services agency leadership and the need to focus efforts on reorganizing the agency took time and focus away from hazard mitigation and other priorities. Meanwhile, changeover in the lead person writing the plan – from the consultant in 2004 to the intern
in 2009 – had the benefit of having a more locally-invested core stakeholder consolidating the hazard mitigation information from stakeholders. At the same time, though, an intern does not bring extensive professional planning expertise or training, particularly in regards to clearly communicating to a broad audience through a plan document.

The third major factor influencing hazard mitigation plan quality and implementation was the local political climate. Onslow County is one of many counties nationwide with a powerful group of developers, real estate agents, and elected officials interested in promoting private property rights and limiting land use regulations that will reduce the amount of land available for development. The legacy in Onslow County is permissive land use regulations and strong push back from land development interests when local planners seek to strengthen regulations.

Emergency Services officials are not ignorant of or naïve to this political context. Although the mitigation plan describes one of the purposes of mitigation planning process as a forum for balancing property rights and the public interest, emergency managers are reluctant to have that happen. Instead, they expressed a desire to keep the range of stakeholders involved in mitigation fairly narrow to avoid tainting public safety planning with political conflicts. Handling political conflicts around land use is the role of land use planners working on plan and permit reviews, they argued. Because they are the central stakeholders in the opinion leader network their views can strongly shape the view of the entire network on how to approach mitigation.

This result reflects a conundrum that likely frustrates emergency managers across the nation. They want to help their communities stop putting more and more people and property at risk without having hazard mitigation become another polarizing, politically charged issue. Meanwhile, local planners may not consider hazard mitigation a pressing concern because they feel fully extended with the controversial land use conflicts they deal with on a daily basis without adding hazard risk reduction on top of their responsibilities.
Appendix V

Making the Connections in New Hanover County

Strong Connections between Emergency Managers and Local Planners Foster Integration of Land Use into Hazard Mitigation

New Hanover County is a fast-growing, urbanized, wedge-shaped county bordered by the Atlantic Ocean and the Cape Fear River. In the face of a pro-development political culture, the county has a strong land use planning program and a history of close inter-governmental cooperation on land use issues with its largest municipality, Wilmington. The county’s hazard mitigation plan provides an easy-to-read, well-illustrated presentation of a wide range of data on hazard vulnerabilities and existing capabilities. That information provides the foundation for a balanced mitigation strategy of emergency services and drainage projects, educational programs, and land use approaches to mitigation. As evidence from the county’s mitigation plan and survey responses from 20 mitigation committee members and interviews with seven key stakeholders¹ show, the network of mitigation stakeholders consists of a small core group of well connected emergency managers and land use planners surrounded by a diverse array of more loosely connected peripheral stakeholders. Working within a state policy approach that allows local discretion in approaches included in mitigation plans while requiring accountability of implementation of local land use plans, the network of stakeholders formulated an aggressive set of land use policies to reduce hazard risks in the face of pressures to develop in hazardous areas.

This chapter consists of a brief description of the case setting (section V.1), followed by a summary of two types of hazard mitigation planning outputs: the incorporation of land use approaches into the hazard mitigation plan (V.2) and ongoing implementation of land use approaches

¹ The interviewees included two county emergency management officials, two county planning officials, one county health official, and two municipal zoning officials. See Chapter 4 for more information on the selection and procedures for the interviews.
to mitigation (V.3). It then reviews the influence of four aspects of local mitigation planning on mitigation planning outputs: the planning process used to develop the plan (V.4) the network diversity (V.5), the network structure (V.6), and bridging the expertise boundary between emergency managers and planners (V.7). The interplay of local community characteristics and the state policy context with the planning process and network-oriented characteristics are addressed throughout. The chapter concludes with a summary of the key findings from the case (V.8).

V.1. Case Setting

New Hanover County (see Figure V.1) is a fast-growing, highly urbanized coastal county located in southeastern North Carolina with a population of 160,307 in 2000 (US Census 2000). One main city, Wilmington (population 75,838 in 2000), and three smaller, beachfront municipalities: Carolina Beach (population 4,701 in 2000), Kure Beach (population 1,507 in 2000) and Wrightsville Beach (population 2,593 in 2000), contained more than half the county’s population. Between 2000 and 2010, the county population grew 26.4% and Wilmington’s grew 40.4% and the county had a population density of 1,058 people per square mile in 2010 (Census 2000 and 2010). More than 80% of the county’s employment is in the private sector and the county’s economy is quite diversified, including major employers General Electric, New Hanover Regional Medical Center, PPD, the University of North Carolina – Wilmington, and Cape Fear Community College (New Hanover County Multi-Jurisdictional Hazard Mitigation Plan 2010). The county has a pro-development political culture with an active homebuilder’s lobby. Socio-economically, the county has higher median home values, lower poverty rates, and more highly educated adults than the national average (see Table VI.1 in Appendix VI). Bounded on the east by the Atlantic Ocean and on the west by the Cape Fear River, the county forms a wedge-shape narrowing to a tip at the mouth of the Cape Fear River.

In the mid-to-late 1990s, New Hanover County experienced a series of four major hurricanes – Bertha, Fran, Bonnie and Floyd – that resulted in Presidential Disaster Declarations. The last of the four, Hurricane Floyd in 1999, resulted in nearly $25 million in housing losses. Since then there have
been two Presidential Disaster Declarations in the county, Hurricane Ophelia in 2005 and Tropical Storm Hanna in 2008. Large portions of the county’s floodplain are already developed. Approximately 37% of the county’s area is in the 100-year, 500-year or coastal V flood zone, with nearly 11,000 buildings valued at more than $8 billion in those areas. In terms of repetitive loss properties, as defined under the National Flood Insurance Program (NFIP), there are 311 properties. Since 1978, more than $89 million in NFIP claims have been paid out to repetitive loss properties in New Hanover County. Countywide exposure of extensive development to water-related hazards makes planning to mitigate natural hazards a vital public interest in New Hanover County.

V.2. Planning Outputs: Hazard Mitigation Plan Quality

New Hanover County’s current hazard mitigation plan was adopted in 2010. The plan is a well-organized and easily readable 346-page document. The plan’s content reflects thorough analysis of a broad sweep of data and goes well beyond the basic requirements set out by FEMA, although there are places where more detail or analysis could strengthen the plan’s cohesion and case for increasing mitigation efforts.

Overall, the plan clearly communicates and seeks to extend the central role of land use approaches in mitigation efforts in the county and participating municipalities. In the introduction, the plan states: “it is essential that projected patterns of future development are evaluated and considered in terms of how that growth will increase or decrease a community’s overall hazard vulnerability” (NHCMJHMP 2010, page 1:1). One purpose of mitigation planning efforts is to help achieve community goals beyond reducing hazard risks.

\[2\] This dissertation focuses on the period prior to Hurricane Irene in August 2011.
In addition to identifying those assets potentially at risk to identified hazards, it is important to identify and assess those particular segments of the resident population in New Hanover County that are potentially at risk to these hazards. Through further demographic and geospatial analysis of best available population datasets, it becomes possible to identify some level of social vulnerability for New Hanover County.

Population change is a factor that contributes to an overall understanding of vulnerability and development trends (discussed further below). According to the U.S. Census Bureau, the rate of population growth in New Hanover County between 1990 and 2000 was 33.3 percent, somewhat higher than the state average population growth of 21 percent. Between 2006 and 2008, the population grew 15 percent, representing continued population growth in the county. Much of this growth can be seen in the communities of Wrightsville Beach and Carolina Beach, as well as along...
For example, the plan notes:

“[t]he concept of multi-objective planning is emphasized throughout this document, identifying ways to link hazard mitigation policies and programs with complimentary (sic) community goals related to housing, economic development, downtown revitalization, recreational opportunities, transportation improvements, environmental quality, land development, and public health and safety” (NHCMJHMP 2010, page 11).

New Hanover County’s hazard mitigation plan presents a comparatively aggressive, well-coordinated approach to employing land use approaches to address hazard mitigation. Incorporation of land use is stronger for the future-oriented polices and implementation principles of plan quality than for the fact base principle.

V.2.a. Fact Base Principle: Capability Assessment

The New Hanover County mitigation plan’s capability assessment presents much more breadth of coverage than depth. The New Hanover County mitigation plan includes a stand-alone Capability Assessment developed through a survey of local officials conducted by PBS&J consultants (NHCMJHMP 2010). The survey responses were organized into a series of matrices summarizing four main types of capabilities for each jurisdiction (planning and regulatory, administrative and technical, fiscal and political), followed by bullet points providing brief narrative descriptions of the information in the matrices (NHCMJHMP 2010). In spite of the well-organized presentation of the four types of capabilities, the information is superficial in that the matrices simply include checkmarks to denote a capability exists. The accompanying bulleted narratives consist of a mix of

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3 First, for the planning and regulatory capability, the plan identifies which of more than twenty different plans, ordinances and programs each of the four jurisdictions has. New Hanover County, Wilmington, and Carolina Beach each have more than three-quarters of the plans and regulations, while Kure Beach has more than half. Second, for administrative and technical capabilities, the plan identifies high levels of land related staffing. Two or more jurisdictions report having each of the following types of staff: planners with knowledge of land use development land management practices, planners and/or engineers with knowledge of natural and/or human caused hazards, floodplain managers, personnel skilled in GIS and/or HAZUS and resource development or grant writers. Third, for fiscal capabilities, the plan identifies a fairly diversified set of funding streams, although specific detail is lack about funding levels and past uses of the funding streams. Two or more jurisdictions indicated having access to each of the following: capital improvement programming, community development block grants, development impact fees, and general obligation and revenue bonds. Fourth, for political capability, the jurisdictions provided one-paragraph narrative descriptions of if and how political leaders have been willing to take mitigation actions that require political will.
boilerplate language not specific to the jurisdictions covered by the plan and very brief descriptions of
the local context for the capability (e.g. the plan title, date of adoption and participating
jurisdictions).\(^4\) For each of the four types of capabilities and overall capability, the jurisdictions
provide summary self-assessments (i.e. low, medium or high) with New Hanover County,
Wilmington and Carolina Beach indicating mostly medium capability and Kure Beach indicating low
capability.

In terms of specific land use-related capabilities, the county indicated capabilities related to
permitted land uses, density of land uses allowed, subdivision regulations, and the use of impact fees
or special study areas related to hazards, among others. As noted, the plan addresses these
capabilities in general ways that preclude determination of specific gaps in existing capabilities.
Similarly, land use plans for New Hanover County and the participating municipalities are only
briefly mentioned in the plan. The hazard mitigation plan indicates New Hanover County and each of
the participating municipalities have a Coastal Area Management Act (CAMA) Land Use plan
(NHCMJHMP 2010).\(^5\) The capability assessment does not identify specific goals, policies or other
aspects of the CAMA land use plans that serve to support or encumber hazard mitigation efforts.\(^6\)

The capability assessment concludes with quantitative synthesis of each jurisdiction’s
capability assessment and a brief description of how the capability assessment combines with the risk
assessment to provide a foundation for the mitigation strategy. In a quantitative scoring system used
by PBS&J, New Hanover County received 67 of 82 possible points, and Wilmington and Carolina
Beach received 60, which are deemed high capacities, while Kure Beach received 39, which is

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\(^4\) The generic descriptions are essentially identical to descriptions in other PBS&J developed plans and provide
little specific information about the zoning ordinances in New Hanover County. See for example the capability
assessments in the Brunswick County Multi-Jurisdictional Hazard Mitigation Plan (NC) and Houston-Galveston
Area Council Regional Hazard Mitigation Plan (TX).

\(^5\) It also notes that Wilmington has a Future Land Use Plan to guide development through 2025, which builds
upon the adopted CAMA plan.

\(^6\) County planning officials noted that they are working on a new comprehensive plan and that they plan to go
well beyond the CAMA planning requirements from the state.
moderate capacity. The systematic method of analyzing capabilities provides valuable insight, but runs the risk of missing the nuance necessary to craft specific mitigation actions. The approach to combining the capability and risk assessments consists of simple 3x3 matrices with columns showing hazard risk (limited, moderate or high) and rows showing capability (high, moderate and limited). While these matrices make the important connection of integrating the two assessments to ensure that the mitigation strategy address place-specific challenges, they do so in a cursory fashion that does not provide a clear link to the specific policies and actions proposed in the mitigation strategy.

The mitigation plan includes important land use-related maps, although linkages between existing land uses and zoning, hazard risks, and future policy directions are limited. Clearly labeled zoning classifications are mapped for the county, Carolina Beach, and Wilmington and the zoning maps are overlaid with maps of three hazards: floods, storm surge and wildfire. For each hazard, three different levels of risk are represented (e.g. 100-year, 500-year and Coastal VE zones). The narrative accompanying the zoning and hazardous area maps is brief and generic and fails to highlight potential areas of conflict between zoning and hazard risks, which would be useful in developing targeted mitigation strategies.

In summary, the capability assessment provides a snapshot of strong policy, administrative, and technical planning capacities and moderate financial and political capacities at the both county and municipal levels. The assessment is extremely well organized and easy to read, building sequentially to a quantitative overall capability score for each jurisdiction. Yet, targeted, deep insights into key gaps in the existing capabilities, especially in terms of land use policy, are lacking. Likewise, opportunities are missed to highlight how past and planned land uses conflict with goals related to hazard risk reduction.

V.2.b. Policies Principle: Mitigation Strategy

New Hanover County organizes its mitigation strategy into four Mitigation Action Plans (MAPs) of discrete actions each participating jurisdiction intends to complete (NHCMJHMP 2010). New Hanover County’s MAP includes 32 actions, Wilmington’s includes 32 actions, Carolina
Beach’s includes 43 actions, and Kure Beach’s includes 7 actions. The MAPs lack synthetic narratives explaining how the array of actions fit together or why some approaches are prioritized over others.

In addition to a wide range of emergency communications, education, drainage and retrofit, and other actions, New Hanover County’s 2010 MAP includes six specifically worded, land use-related actions. One of the six dated from the original 2005 mitigation plan and five new actions are drawn from the 2006 New Hanover County-Wilmington CAMA Land Use Plan. Four examples demonstrate the much clearer, more specific, future-oriented language of the actions compared to tentative (e.g. “consider” or “encourage”) and business-as-usual oriented (e.g. “maintain” or “continue”) language found in many plans:

- Action 22 is “[f]ollowing a storm event, take advantage of opportunities to acquire or purchase land located in storm hazard areas which are rendered unbuildable or have sustained substantial damage. The property should satisfy objectives including, but not limited to the conservation of open space and scenic areas and the provision of public water access” (NHCMJHMP 2010 page 9:20).

- Action 23 is “[d]eclare a moratorium on the acceptance of any request for rezoning in flood prone areas other than rezoning for a less intense use” (NHCMJHMP 2010, page 9:21).

- Action 24 is “[d]eclare a moratorium on the permitting of any new construction, new utility hookups, or redevelopment construction that would increase the intensity of land use existing in disaster prone areas” (NHCMJHMP 2010, page 9:21).

- Action 26 is “[l]imit density to 2.5 units/acre or less in areas classified as conservation on the CAMA land use map (including areas in the 100 year, or 1% annual change floodplain). Develop a program for density tradeoffs to encourage development outside the floodplain” (NHCMJHMP 2010, page 9:22).

The actions are also aggressive in terms of their content, not just their language. By comparison, out of the plans for 175 jurisdictions evaluated in the first part of this dissertation only ten other jurisdictions included provisions related to the density of land use (Actions 23, 24 and 26) and only one other jurisdiction included a density tradeoff or transfer provision (Action 24). Action 22 makes important multi-objective linkages by connecting land use for hazard mitigation purposes to the

7 The other two actions directly related to land use are incorporating Firewise Communities/USA standards into the subdivision review process and limiting high intensity uses in the 100-year floodplain.
conservation of open space and provision of public access to waterways. The New Hanover County MAP also includes land use-related efforts like completing an open space plan giving major consideration to hazard mitigation, revising the stormwater management ordinance, and acquisition, elevation and retrofitting of properties in hazardous areas.

Inclusion of land use-related actions in the three participating municipalities’ MAPs varies. Twenty of the thirty-two actions in the City of Wilmington’s MAP are structural projects to address flooding hazards and ten are related to emergency services and protecting municipal property. It includes no specifically land use-oriented actions. Carolina Beach’s MAP includes multiple actions to support and strengthen its CAMA land use plan and zoning and subdivision ordinance, actions to build the town’s data and analytical capabilities (GIS), and actions intended to educate contractors and property owners about safe development and redevelopment. The seven actions in Kure Beach’s MAP include education actions, elevation and relocation projects, and increasing GIS capabilities, but no actions directly related to land use.

Taken together, the four jurisdictions MAPs cover a broad range of project, policy, and multi-objective actions, reflecting the flexible approach to mitigation planning promoted by the State of North Carolina over the previous ten to fifteen years. An argument can be made, however, that an opportunity is missed to use the mitigation plan to propose even more aggressive land use policies to strengthen the CAMA Land Use Plan.

V.2.c. Implementation Principle: Implementation Information

Information about how land use approaches to mitigation included in the New Hanover County and participating municipality MAPs will be implemented are well organized and somewhat detailed. Summary charts for each proposed action provide multiple pieces of implementation-related information, including whether the action is new or existing, which of six categories of mitigation approaches it fits under, the hazards addressed, the lead agency/department, the estimated cost, the implementation schedule, the priority level and the action implementation status as of 2010 (see Figure V.2 for an example). Each of the six land use actions in the New Hanover County MAP are
‘high priority’ and the five land use actions that are new in the 2010 plan are the responsibility of the county planning department. While the high prioritization and clear designation of responsible agencies denote forethought about how the actions will be implemented, the proposed schedule and estimated cost for all six are ‘TBD.’ The lack of more specific details, even if they were simply ‘next five years’ for the timeline and ‘county staff time’ for cost, are clear gaps.

**Figure V.2: Examples of Mitigation Actions and Associated Implementation Information**
(NHCMJHMP 2010, page 9:20)

<table>
<thead>
<tr>
<th>New Hanover County Mitigation Action 22</th>
<th>Following a storm event, take advantage of opportunities to acquire or purchase land located in storm hazard areas which are rendered unbuildable or have sustained substantial damage. The property should satisfy objectives including, but not limited to the conservation of open space and scenic areas and the provision of public water access.</th>
</tr>
</thead>
<tbody>
<tr>
<td>New or Existing Action:</td>
<td>NEW</td>
</tr>
<tr>
<td>Discussion:</td>
<td>The property should satisfy objectives including, but not limited to the conservation of open space and scenic areas and the provision of public water access.</td>
</tr>
<tr>
<td>Category:</td>
<td>Property Protection</td>
</tr>
<tr>
<td>Hazard(s) Addressed:</td>
<td>Multiple</td>
</tr>
<tr>
<td>Lead Agency/Department Responsible:</td>
<td>Planning and Zoning</td>
</tr>
<tr>
<td>Estimated Cost:</td>
<td>TBD</td>
</tr>
<tr>
<td>Potential Funding Sources:</td>
<td>NC CWMTF, Pre-Disaster Mitigation Program, other grant sources</td>
</tr>
<tr>
<td>Implementation Schedule:</td>
<td>TBD</td>
</tr>
<tr>
<td>Priority (High, Moderate, Low):</td>
<td>High</td>
</tr>
<tr>
<td>Action Implementation Status (2010):</td>
<td>new</td>
</tr>
</tbody>
</table>

Incorporation of the hazard mitigation plan into other planning initiatives is discussed in broad, generic ways, but the plan also includes specific items that demonstrate the desire of the county and participating municipalities that the plan not just sit upon a shelf. The county will recommend that all goals and strategies are consistent across plans and do not increase hazard risks. In line with this recommendation, goals and strategies from the hazard mitigation plan were incorporated into the New Hanover County-City of Wilmington CAMA Land Use Plan. When other

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8 The one pre-existing land use action is the responsibility of the fire administration, inspections department and county attorney.
plans (e.g. comprehensive, CAMA land use, emergency operations) are updated, the county will provide a copy of the hazard mitigation plan to the responsible official (NHCMJHMP 2010). An interesting statement in the mitigation plan identifies the main mechanism by which the mitigation plan is intended to affect other planning initiatives:

“[T]his stand-alone Multi-jurisdictional Hazard Mitigation Plan is deemed by the New Hanover County Mitigation Advisory Committee to be the most effective and appropriate method to implement local hazard mitigation actions at this time. As such, the primary means for integrating mitigation strategies into other local planning mechanisms will be through the revision, update, and implementation of each jurisdiction’s (sic) individual Mitigation Action Plan that require specific planning and administrative tasks (e.g. plan amendments, ordinance revisions, capital improvement projects, etc.)” (NHCMJHMP 2010, page 10:2).

This approach of using the mitigation plan to identify and promote specific changes to other plans, policies and projects may focus local efforts and improve monitoring of implementation success.

Finally, the plan also notes that all mitigation actions are reviewed annually as part of the Community Rating System requirements, which demonstrates an expectation of local stakeholders that their progress on implementing the mitigation plan will be tracked by FEMA.

V.3. Planning Outputs: Implementation of Land Use Approaches to Mitigation

Implementation of specific actions in the New Hanover County mitigation plan and ongoing mitigation-related land use actions has, for the most part, occurred on schedule, although stakeholders identified a number of constraints that limit greater progress. New Hanover County’s 2011 Community Rating System (CRS) Progress Report provides a clear and concise update on all 32 actions included for New Hanover County in the 2010 hazard mitigation plan and indicates that most actions have been completed on time. Most of the specific land use-related actions in the county

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9 For this case study, effort was focused on assessing implementation of county-level actions. However, interviews with municipal stakeholder indicated mixed progress on implementing actions in their MAPs with ongoing implementation of pre-existing plans and ordinances (e.g. CAMA Land Use Plan and day-to-day permitting) and some education programs taking place.

10 In regards to developing an open space greenway master plan in partnership with the City of Wilmington and the Wilmington Metropolitan Planning Organization, the CRS report notes that “[t]his plan will give major consideration to hazard vulnerability for conservation and acquisition” (CRS Progress Report 2011, page 6.) The open space plan is set to be complete in 2012 and the county has worked to purchase open space properties that could have been developed using funds from the Clean Water Management Trust Fund. Flood maps are

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MAP have been or are in the process of being implemented. The set of land use regulations limiting development in hazardous areas (Actions 21, 22, 23, 24, and 26) date from the 2006 CAMA Land Use Plan and are implemented as development situations arise. Although not listed in the MAC, the county adopted an Exceptional Design zoning district in 2009 that allows developers to gain density bonuses by accruing points by incorporating sustainable practices based off LEED standards for neighborhood development. One of the six core requirements is not developing in the floodplain.\textsuperscript{11}

Responses from Mitigation Advisory Committee members indicate moderate levels of use of generic land use approaches—not limited to implementation of the mitigation plan—in their ongoing work in 2011 (see Table V.1). Involvement of more than a half dozen different stakeholders using regulatory land use approaches (i.e. limiting development and setbacks and buffers) to guide development away from hazardous areas and preserve complementary natural mitigation features points to commitment a robust ongoing planning program. More limited efforts on project-oriented approaches (i.e. acquisition approaches) requiring funding is not surprising. Efforts to incorporate the mitigation plan into other initiatives and ongoing modeling and analysis illustrate ongoing efforts to maintain or build capacities related to using land use approaches to mitigation hazards.

\begin{footnotesize}
\begin{itemize}
\item The county won a NC Chapter of the American Planning Association award for the district and is attracting interest among local developers.
\end{itemize}
\end{footnotesize}
Table V.1. Committee Members’ Self-Reported Efforts to Implement Land Use Actions

<table>
<thead>
<tr>
<th>Land Use Action Type</th>
<th>Percent of Committee Members Reporting Effort (Number reporting/total respondents)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limit development in hazardous areas</td>
<td>47% (9/19)</td>
</tr>
<tr>
<td>Setbacks, buffers and regulations to protect natural mitigation features</td>
<td>37% (7/19)</td>
</tr>
<tr>
<td>Elevating or Acquiring Properties</td>
<td>11% (2/18)</td>
</tr>
<tr>
<td>Acquire land to protect natural mitigation features</td>
<td>33% (6/18)</td>
</tr>
<tr>
<td>Incorporate hazard mitigation plan into other planning initiatives</td>
<td>67% (12/18)</td>
</tr>
<tr>
<td>Land use modeling and/or analysis</td>
<td>33% (6/18)</td>
</tr>
</tbody>
</table>

The CRS Progress Report 2011 and interviews indicate that the major obstacle faced for project-oriented actions was a lack of grant and/or operating funds. As one interviewee said, “it’s pretty much the obstacle for every one of them [i.e. stalled actions].” In particular, stakeholders described the difficulty purchasing repetitive loss properties and converting those properties to open space. First and foremost, they pointed to the relatively high property values in dense and fast-growing New Hanover County. When property owners are approached about having their property bought by the government, they pass on the opportunity because they feel they can generate more income through private sale. Even if the funds necessary to compete on the private market were available, interviewees noted that as public servants they would be hesitant to pay the high prices demanded in many cases. Further, when there is a major disaster declaration in multiple North Carolina counties, jurisdictions with lower property values – most of coastal North Carolina – can get more mitigation benefits per dollar of cost and grant applications from New Hanover County are less competitive. A corollary issue raised was elected officials were reluctant to undertake buyouts in some cases because of the reduction in the tax base.
A second challenge for purchasing repetitive loss properties is that they are sometimes isolated, such as a lot or two in a neighborhood. Often, linking such properties to greenways or other open space is not feasible and the possibility of obtaining additional public benefit from the property is limited. Third, when purchased, properties have to be maintained by the local government, which incurs costs not necessarily provided by mitigation grant funds. In contrast, stakeholders recounted much greater success in project-oriented mitigation actions such as buyouts and elevation during the pre-disaster oriented Project Impact phase (discussed in section 10.4), when there was dedicated funding available.\footnote{An example within this case developed through conversations with county staff and a site visit reflects some of these challenges but also points to the potential of linking hazard mitigation objectives with other planning objectives like creating open space and improving water quality. Nine severe repetitive loss properties in the Candlewood Neighborhood were purchased in 2003 using FEMA hazard mitigation grant funds. Seven homes backed up to Smith Creek and two more homes were across the street. All were demolished and the land was returned to open space. For a number of years, due to limited funding and administrative priorities the property was not maintained and became overgrown and the site for illegal dumping of vegetation or trash. Recently, it has been cleaned, including removal of invasive species with a grant from the Fish and Wildlife Service, and a group of University of North Carolina-Wilmington students created a primitive trail across the property. The county’s efforts are not complete, however. The creek, which is channelized and has poor water quality, continues to flood across the road during major events. County planners would like to apply for a grant to restore the creek to a more natural flow and create wetland features to absorb runoff. The privately-owned property on the other side of the creek is also preserved as open space. The county hopes to link these two properties with a Smith Creek greenway/blueway extending across the northern tier of the county, allowing for passive recreation such as hiking and kayaking.}

For land use-related actions, a major obstacle to implementation is the pro-development political context that resists additional land use regulation and control. Although the county has had recent successes in bolstering its land use program, staff pointed to ongoing challenges such as inability to limit development in hazard-prone areas that have been permissively zoned for a long time. Multiple factors have contributed to the limited-regulation, pro-growth views in the county, including ongoing rapid population growth spurring demand, already high density that leaves limited land suitable for new development, and the desire of many to live along waterways because of the amenity value. Another important factor has been the limited attention given to mitigation in general by the public and elected officials. Stakeholders pointed to the long period of time since a major
event and the widely perceived need to focus on short-term priorities, especially in tight economic
times as a reason for the low priority given to mitigation.

A final, crucial point raised in the interviews points to the lack of accountability built into the
federal mitigation planning program framework. One stakeholder contrasted the jurisdiction’s DMA-
compliant mitigation plan with its state mandated CAMA land use plan. The CAMA Land Use plan
gets used heavily in day-to-day decision making-situations whereas the hazard mitigation plan gets
referenced much less frequently. Under the state’s CAMA legislation, permitting decisions in a
jurisdiction have to be consistent with its CAMA plan, which commands the attention of local staff
and elected officials when they make land use decisions. Similarly, New Hanover County completes
the annual implementation report not because of hazard mitigation planning requirements under the
DMA but to maintain its Community Rating System status – an incentive based program in which
jurisdictions build points by carrying out flood mitigation activities. Thus, the local implementation
progress seen in this case – progress largely motivated by state CAMA regulations and federal CRS
regulations – provides an argument for strengthening state and federal oversight of local planning
under the DMA.

V.4. Hazard Mitigation Plan Development and Update Process

New Hanover County’s strong hazard mitigation planning history allowed the stakeholders
involved in 2009 planning process to effectively contend with decreasing funding for and interest in
mitigation planning to still develop a strong plan. The key roles played by the consultants and a core
group of committed stakeholders is reflected in the highly readable document and integration of land
use throughout.

Following the series of hurricanes in the 1990s, New Hanover County and Wilmington
jointly participated as pilot communities in FEMA’s Project Impact: Building Disaster Resilient
Communities program, starting in 1997. Project Impact grants enabled the hiring of a Project Impact
Coordinator and funded numerous mitigation projects, including buy-outs of flood-prone properties.
Between the access to funding and fresh memory of hurricane damages, interest and participation

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were high in Project Impact activities. During this period, New Hanover County adopted a hazard mitigation plan in 2002, although the plan was not designed to meet the requirements of the Disaster Mitigation Act (DMA) of 2000 and was much simpler than subsequent plans. The Project Impact program concluded in the early 2000s, bringing an end to the funding and the coordinator position.

In compliance with the DMA, New Hanover County, Wilmington and Kure Beach collaborated to develop the first version of the New Hanover County Hazard Mitigation Plan, adopted in 2005. Access to planning grant funding allowed the county to hire a consulting firm, PBS&J, to lead the planning process. PBS&J planners handled most of the tasks associated with developing the plan, including conducting hazard vulnerability analysis and mapping found especially valuable by local stakeholders. The consultants’ largely positive influence can be seen in the appealing and well-organized template of the plan, the systematic and an easy to interpret capability assessment, and the clear, actionable Mitigation Action Plans for each jurisdiction. At the same time, the lack of specific detail on the specific policies, ordinances, and other capabilities appears to be due to the consultants’ survey approach that emphasizes breadth over depth.

For the 2010 update, planning grant funding was not available and the update process was led cooperatively by county Emergency Management and 911 Communications department staff and Planning and Inspections department staff. While county staff handled most of the tasks, enough local funding was secured to hire PBS&J again to conduct technical analyses, help work with state emergency management officials, and assist with other pieces of the update. According to local stakeholders, the consultants also brought valuable familiarity with the plan document itself, good working relationships with local partners, and a willingness to go beyond the contracted scope of work. The planning process included a Mitigation Advisory Committee (MAC), which included 34 stakeholders representing governmental, private business, and non-profit organizations. In addition to

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13 Carolina Beach and Wrightsville Beach opted to develop and adopt their own plans. Carolina Beach joined the 2010 county-led plan because it did not have external grant funding and did not have the internal resources to update its plan on its own.
the MAC members more than 50 additional stakeholders are identified as having been informed about
the planning process.

The MAC first met in July 2009. An icebreaker exercise designed to get the 17 committee
members in attendance thinking about which categories of mitigation approaches should be
prioritized in the plan identified prevention – including land use approaches – as the most popular
category of mitigation approaches (NHCMJHMP 2010). The second MAC meeting, a ‘Mitigation
Strategy Workshop’ focused on the updated risk and capability assessments and updating the goals,
objectives and actions in the plan, had 22 attendees. A small core group of MAC members were
frequently involved in the process (a few times a week or daily), while roughly a third were
somewhat frequently involved (once a week to a few times a month), and about half were
infrequently involved (once a month or less.) Attempts to engage the public included public meetings,
a public participation survey, and making the plan available online and in public places.¹⁴

To summarize, driven by the hurricane experiences of the 1990s and Project Impact, an initial
burst of activity on mitigation issues in New Hanover County laid the foundation for considerable
investment of time and resources for mitigation planning in 2005. By the 2010 update process,
decreases in federal and state funding support and fading memories of the hurricanes had reduced
funding and participation, although a core group of stakeholders were very active. Together, the core
stakeholders and consultant ensured that the hazard mitigation plan was well-organized and had
strong land use components.

V.5. Hazard Mitigation Stakeholder Network Diversity

Surveys of twenty of the thirty-two steering committee members from the 2009 planning
process still in the mitigation network (see Chapter 4 for more information on the survey procedures)

¹⁴ Although public participation at meetings was essentially non-existent, more than 1,000 responses to the
survey were submitted in January and February 2010. Residents were most concerned with hurricanes and
tropical storms and indicated they found structural projects and property protection as the most important
categories of mitigation actions, reflecting an unsurprising focus on protecting existing private property.
Subsequent to these meetings and the public involvement efforts, the plan was adopted following another public
meeting.
enabled further exploration of the relationship between the diversity of stakeholders in the mitigation network. This analysis indicates that a wide range of stakeholders who bring considerable breadth and depth of planning-related assets participated. The steering committee included 22 different public, private and non-profit entities.\textsuperscript{15} New Hanover County was represented on the MAC by five Planning and Inspections staff, four Health Department staff, three Management and 911 Communications staff, and eight other staff representing a variety of other departments or agencies.\textsuperscript{16} Six staff members represented the three municipalities, including two zoning officials. Steering committee members who responded to the survey conducted for this dissertation reported a wide variety of professional specializations: emergency management, land use planning, engineering, building/electrical code enforcement, solid waste management, law, public health, and business/tourism. Altogether, seven MAC committee members were county Planning and Inspections staff or municipal zoning officials, providing considerable expertise in land use approaches to mitigation. Additionally, PBS&J’s project manager for the 2009 update was a certified professional planner, adding another level of planning expertise to the network (NHCMJHMP 2010). Evidence of this robust planning expertise can be seen throughout the plan – from the core value placed on land use approaches to mitigation in the beginning sections, to the wide array of land use capabilities assessed, to the clear and specific wording and innovative scope of the land use approaches in the jurisdictions’ Mitigation Action Plans.

Given the high number of land use-oriented stakeholders it is not surprising that the stakeholder network has depth and breadth of assets related to planning in general and land use in particular. In terms of committee members’ experience with hazard mitigation, fourteen of twenty committee members indicated having more than 10 years experience and just four reported having

\textsuperscript{15} Non-local government organizations included the American Red Cross, the University of North Carolina at Wilmington, the National Weather Service, the New Hanover Regional Medical Center, the Cape Fear Coast Convention and Visitors Bureau, and a homeowners association. In interviews, emergency management officials highlighted the input from the National Weather Service.

\textsuperscript{16} These included the Board of Education, Engineering, Environmental Management, Fire Services, Human Resources, Information Technology, the County Manager’s Office, and the Public Information Office.
less than 5 years experience. For assets related to developing a plan, sixteen members indicated skills in outreach and communications and eight indicated skills in facilitation, mediation and conflict resolution. Five members indicated analytical technical skills, such as GIS and HAZUS. The consultants and local stakeholders’ analytical technical skills are evident in the mapping relating land use and hazard vulnerability in the plan. Assets related to ongoing plan implementation included seven members with skills in regulation drafting/interpretation, nine with skills in plan and/or site review, and five with executive or legislative rule making authority. Assets related to project based approaches requiring funding included five members with authority to distribute funds for mitigation projects and three with executive or legislative authority for budgeting.

Another important asset for integrating land use approaches into mitigation is favorable views among stakeholders about the effectiveness of preventative land use approaches to mitigation. As seen in Table V.2, New Hanover County stakeholders indicated strong favorable views of preventative land use approaches and related natural resource protection approaches (e.g. wetland conservation), although not as strong as for emergency services.

<table>
<thead>
<tr>
<th>Mitigation Approach</th>
<th>Mean Score *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property Protection</td>
<td>3.8</td>
</tr>
<tr>
<td>Information</td>
<td>3.8</td>
</tr>
<tr>
<td>Preventative Land Use</td>
<td>4.0</td>
</tr>
<tr>
<td>Emergency Services</td>
<td>4.5</td>
</tr>
<tr>
<td>Structural Controls</td>
<td>3.8</td>
</tr>
<tr>
<td>Natural Resource Protection</td>
<td>4.1</td>
</tr>
</tbody>
</table>

n = 17

* 5.0 Very effective to 1.0 Very Ineffective

V.6. Hazard Mitigation Stakeholder Network Structure

Further examining the patterns of relationships between stakeholders provides additional explanations for the strong incorporation of land use approaches in the plan. Overall, the New Hanover County mitigation stakeholder network was relatively large and inactive, but had a stable, interconnected core of emergency managers and land use planners who actively worked together on
mitigation issues. The tight core of emergency managers and local planners, in particular, helps explain the incorporation of land use throughout the hazard mitigation plan and ongoing implementation of land use policies to limit development in hazardous areas.

The network of stakeholders sharing information generated from survey data consisted of 37 organizations, 22 of which were represented on the Mitigation Advisory Committee, as shown in Figure V.3. A core of approximately ten stakeholder organizations had multiple links to other organizations in the core as well as links to peripheral stakeholders. Overall, the network structure exhibited some hierarchical and opinion leader characteristics, such as many peripheral stakeholders connected through a core group of stakeholders. On the other hand, it did not exhibit many peripheral fans wherein one stakeholder was the sole path the rest of the network for many peripheral stakeholders.

The interlaced pattern of ties within the core group was more in line with concepts of a village or small-world network than a hierarchical or opinion-leader network. Although the county Emergency Management and 911 Communications department (shown by the triangle labeled “A” in the center of Figure V.3) had the most connections, multiple other stakeholders were highly connected and central to the network as well. In interviews, key stakeholders described a small core of stakeholder connected to a broad web of diverse stakeholders who are more loosely connected on mitigation issues, corroborating the network structure in Figure V.3.

While no single stakeholder group monopolized connections in the information-sharing network, the county emergency management agency was the hub of the network. It was directly connected to 39% of the other organizations in the network and had the highest betweenness centrality score – indicating that it was a key bridge between other stakeholders. Other central organizations include the City of Wilmington zoning agency (the diamond labeled “B”), the county

17 The degree centrality of the Emergency Management and 911 Communications department was 15 (i.e. connections to fifteen other stakeholder organizations), while the next closest degree centrality was 8. Its betweenness centrality score was 256, which is difficult to interpret in isolation; the next closest score was 88.
Planning and Zoning department (the diamond labeled “C”) and PBS&J (the circle labeled “D”).\textsuperscript{18} In line with the survey results just described, stakeholders described the county emergency managers as the central stakeholders in the network, while also pointing to the county planners as co-leaders in process.

Using terms such as “relater,” “coordinator,” and a “facilitator,” a Wilmington zoning official, who is also the floodplain official, described serving as a bridge between municipal stakeholders and the broader countywide mitigation network. This role can be seen in Figure V.3 in which the three peripheral stakeholders connected to the network by Wilmington zoning were City of Wilmington storm water, public services and ITS agencies (labeled “E,” “F,” and “G” respectively). Similarly, the Carolina Beach zoning official (the diamond labeled “H”) described filling the bridge role between municipal officials (e.g. the town manager, planning director, fire chief and town council) to the broader hazard mitigation network.\textsuperscript{19} Municipal zoning officials and the county emergency managers alike reported ties to the North Carolina emergency management agency (the triangle to the labeled “I”), emphasizing the helpful role of state officials in developing and submitting mitigation grant applications and state leadership on innovative floodplain mapping.

\begin{flushleft} \textsuperscript{18} Other local organizations highly central to the network include the New Hanover Health Department, the Cape Fear Convention and Visitors Bureau, and the New Hanover County Board of Education. \end{flushleft}

\begin{flushleft} \textsuperscript{19} The Carolina Beach zoning official did not report those connections in the survey responses used to create Figure 11.3 but did in an interview. \end{flushleft}
Figure V.3: New Hanover County Information Sharing Network

Organization Expertise Type

- Emergency Management
- Planning
- Other Expertise
As noted earlier, the hurricanes of the 1990s and Project Impact injected energy and funding into mitigation activities – broadening and strengthening ties among stakeholders – but since then the network has become smaller and less active over time. As one stakeholder put it, there has been a “gradual falling off.” While annual updates prompted regular interaction and email and phone communication occurred as mitigation issues arose during the year, more intensive mitigation planning activities (e.g. face-to-face meetings and more frequent contact) took place during the update processes once every five years. Key factors in the changes in network size and activity were due to a lack of grant support to engage in mitigation planning, general complacency as memories of damaging hurricanes receded into the past, and local jurisdictions struggled to gain approval for mitigation grant proposals. Stakeholders acknowledged that relationships “drift apart over time when they’re not activated,” although among the core group of stakeholders the ties remained strong throughout this period.20

Ongoing strong ties within the core group of stakeholders can be attributed to extensive intergovernmental cooperation between New Hanover County and the City of Wilmington and to other emergency management efforts that result in frequent contacts between stakeholders. In 2006, the county and city adopted a joint Coastal Area Management Act Land Use Plan. Wilmington contracted with the county to handle its land use permits, including Coastal Area Management Act (CAMA) permits, while the city managed its own floodplain management and zoning. As the Wilmington zoning official said, “there’s seldom a day that goes by that I don’t talk with someone over at the county building.” By comparison, municipal ties between Wilmington and the beach communities have been weaker because Pleasure Island (i.e. Carolina Beach and Kure Beach) has historically functioned on its own and is geographically separated from downtown Wilmington. Another important reason ties within the core group of stakeholders remained strong was frequent cooperation on other emergency management initiatives. Annual hurricanes preparedness and

20 Although not a problem raised in the other jurisdictions in New Hanover County, Carolina Beach has experienced considerable staff turnover – four planning directors in less than ten years. In terms of the Mitigation Advisory Committee, all but two of the members were still with their same agencies in late 2011.
training efforts have been countywide and when the Emergency Operations Center has been activated, as it was recently for Hurricane Irene, stakeholders sit together for hours on end and often have time to discuss their activities and how they can work together more effectively.

To summarize, the overall structure of New Hanover County’s hazard mitigation stakeholder network was a hybrid of hierarchical and opinion leader characteristics (e.g. numerous peripheral stakeholders) better suited to consolidating and distributing information and small world or village characteristics (e.g. the interconnected core with bonding and bridging links) better suited to joint problem solving. Although the size of the network has diminished and some ties have weakened over the last ten years, the core stakeholders – including emergency managers and land use planners – have maintained close ties through a combination of city-county cooperation on land use planning, emergency preparedness activities, and periodic hazard mitigation meetings, phone calls, and emails. Altogether, these characteristics of the network have led to a hazard mitigation plan that demonstrates deep understanding of the connections between land use and hazard mitigation throughout.

**V.7. Bridging the Emergency Management – Land Use Planning Expertise Boundary**

The previous sections have illustrated that strong ties bridged the emergency management – land use planning expertise boundary in New Hanover County. The strong ties have been important not only for developing a hazard mitigation plan that integrates land use approaches, but also in supporting ongoing implementation efforts targeted at more aggressive development regulations to reduce hazard risks.

The simple fact that Wilmington and Carolina Beach zoning officials served as their municipalities’ point-people to work with county emergency managers on mitigation established a bridge that was activated regularly during the recent update process. Even tighter were the bonding connections between the county Emergency Management and 911 Communications and Planning and Zoning departments. Bonding connections dated back at least as far as hurricanes of the 1990s and were strengthened during the Project Impact phase from the late 1990s to early 2000s. Those connections have been maintained over time and for the 2009-2010 process, staff from the two
departments shared responsibility for leading and coordinating the update of the plan. As noted above, five members of the planning department, including the director, long-range planner and floodplain administrator, served on the MAC together with two emergency management officials, including the director and an emergency management specialist.

Interviews with county emergency managers and planners brought to light views that partnerships between emergency managers and planners and incorporating land use approaches are essential for effective hazard mitigation. From the emergency management perspective, local planners were “a critical piece of the puzzle.” Articulating their understanding of the intimate land use-mitigation link, emergency managers expressed frustration “because we see things happening that don’t make good sense.” When development in hazardous for short-term economic and tax-base benefits was advocated, emergency managers foresaw long-term repetitive losses and the need for future buyouts. This type of conflict arose in regular emergency management responsibilities, which included participating in the review of all subdivision plans and making mitigation-related comments about potentially negative impacts such as increasing density in the 100-year floodplain or increasing evacuation times. Emergency managers felt that their feedback on subdivision plans was often perceived as going against development and may have contributed to limited engagement by developers in mitigation planning processes. While the day-to-day work of planners involved more interaction with development interests, emergency management officials noted that their own preparedness efforts provided access to a wide range of important stakeholders that local planners were less likely to be connected to, such as the weather service, schools, and emergency responders.

Likewise county planners described emergency management staff as their closest partner on mitigation issues. Planners identified the fundamental rationale for their active involvement in mitigation issues as their unique perspectives and work on guiding development and considering long-range impacts of development, especially including exposure to flooding. Beyond enforcing building codes and standards, in the planners’ views floodplain management also entails regulating development of land in the floodplain. They also described the importance of partnerships with
emergency management for success under the Community Rating System (CRS) program. Looking forward, they discussed the need for efforts to better link water and sewer location decisions being handled by a newly created public utility authority with understanding of hazardous areas because of the critical role those investments have on development patterns. Finally, an additional important point is that the county emergency Management and 911 Communications and Planning and Inspections offices were located next to each other in the same building, providing easy opportunities for regular interactions that often strengthen relationships.

In summary, emergency managers and land use planners have had and continue to maintain strong bonding connections in their ongoing work and share views on the importance of increasing the use of land use approaches to reduce and eliminate hazard risks. Much of the success New Hanover County and its municipalities have had in using land use approaches to hazard mitigation can be attributed to the central role taken by land use planners and the bonding ties between land use planners and emergency managers.

**V.8. Summary**

New Hanover County experienced a series of major hurricanes in the mid-1990s and, in partnership with its largest municipality Wilmington, participated as a pilot site in FEMA’s Project Impact program. Those experiences increased attention to hazard mitigation and the key role of land use approaches in mitigating hazard risks. A loosely connected, diverse network of stakeholders was strengthened by a core group of emergency managers and local planners who worked with consultants to develop a strong mitigation plan. While the plan is short on detail and synthesis in places, on the whole it is well organized, easy-to-read and integrates land use approaches throughout. Stakeholders have made timely and measurable progress implementing the comparatively aggressive set of land use approaches in the plan in the face of a pro-development political climate.

This case study points to the critical role played by the network of stakeholders engaged in hazard mitigation planning and implementation and how their efforts are shaped by the state and federal policy context and local community characteristics. A key finding is that even in a county
with very fast population growth and a pro-growth political climate exerting pressures to develop in hazardous areas, a small core group of interconnected emergency managers and local planners surrounded by peripheral stakeholders with diverse backgrounds has developed and is implementing a pro-active mitigation plan. The tight connections between the core stakeholders represent bonding ties of trust, familiarity, and a shared purpose developed over the last 10 to 15 years working together to reduce hazard risks through mitigation efforts. The weaker bridging connections to peripheral government and non-government stakeholders provides access to the wide range of information needed to grapple with mitigation challenges and maintains important ties that can be activated when needed. This network structure reflects a balance of characteristics suited to command-and-control style operations (i.e. peripheral ties to a core associated more with a hierarchical or opinion-leader network) and characteristics suited to collaboration and joint-problem solving (i.e. a balance of bonding and bridging ties associated more with small-world and village networks) (Siegel 2010).

Four additional features of the network drive the strong land use components of the county’s mitigation approach. First, the involvement of multiple land use plan-oriented stakeholders, including the county’s planning director, long-range planner and floodplain administrator, and municipal zoning officials, brings critical land use-related experience, skills and responsibilities to the network. Second, even in the lulls in mitigation efforts, the local planners work closely with emergency managers on hurricane preparedness and emergency operations center activities that allow the stakeholders to keep their relationships fresh and productive. Third, reinforcing these individual relationships is the strong inter-governmental coordination that takes place between the county and Wilmington, particularly around long-range land use planning and ongoing implementation of the development management program. Fourth, the stakeholders have made a concerted effort to maintain their relationship with the planning consultants, who brought valuable technical and facilitation skills, planning certification, and a well designed plan template. Altogether, these features have led to one of the stronger mitigation plans in the sample of 175 plans analyzed earlier in this dissertation, particularly in regards to its land use approach. More importantly, the core group of
stakeholders is experiencing success implementing policies, developing plans and conducting
education efforts from the plan’s mitigation strategy. Additionally, the stakeholders conduct ongoing
monitoring of their efforts to meet state CAMA requirements and federal CRS requirements
providing important feedback on what is and what is not working.

There are four final points of emphasis related to state and federal implementation of the
national mitigation framework. First, the funding from Project Impact provided a critical boost to
local efforts to build their mitigation network and other capacities in the wake of major hurricanes.
This impact speaks to the high value of proactive, pre-disaster mitigation support from higher levels
of government. It aligns with the findings of Mandarano (2009) and Schneider et al. (2003) related to
the National Estuary Program that the federal program had built local network capacity.

Second, as access to federal funding and local economic resources available for mitigation
have waned activity among the peripheral stakeholders has also decreased. On the one hand, this
reduction in participation reflects the key role increasing access to funding plays for local officials
who typically work under conditions of tight budgets and can only attend so many meetings that do
not address their core responsibilities. Yet, on the other hand it also points to how building the
national mitigation framework primarily around accessing federal disaster funds creates few
incentives for strong commitment to mitigation planning for many stakeholders.

Third, the local stakeholder network was enabled to pursue a balance of project, program, and
policy-oriented approaches to mitigation by the flexible approach to coordinating local mitigation
plan taken by the State of North Carolina. This balanced approach has allowed core mitigation
stakeholders to continue to make progress on programmatic and policy-oriented approaches when
funding for project-oriented approaches has failed to materialize and the broader network has shrunk,
as has been the case for almost a decade. Should funding become available again in the future,
continued activity of the core group of stakeholders also means the broader network can be re-
activated quickly. Thus, the resilience and adaptability of the New Hanover County mitigation
network to changing conditions is facilitated by state implementation of mitigation policy and the strong ties between emergency managers and land use planners.

Finally, the push to implement the actions in the mitigation strategy, use the mitigation plan in decision situations, and monitor ongoing implementation progress comes from being held accountable by state enforcement of CAMA and federal enforcement of CRS participation, not enforcement of the Disaster Mitigation Act. The implication is that enforcement of the DMA through a binary decision – plan is approved or not approved – alone would have resulted in the New Hanover County hazard mitigation plan ‘sitting on the top shelf and collect dust’ were it not for local compliance with a state mandate and participation in a federal incentive-based program that holds stakeholders accountable for actions they include in their plans.
Appendix VI

Supporting Data for Case Studies

Table VI.1: Socio-Economic Characteristics of Case Study Counties *

<table>
<thead>
<tr>
<th></th>
<th>Brevard County</th>
<th>Martin County</th>
<th>Onslow County</th>
<th>New Hanover County</th>
<th>National Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median Home Values</td>
<td>$87,600</td>
<td>$114,400</td>
<td>$78,200</td>
<td>$127,900</td>
<td>$111,800</td>
</tr>
<tr>
<td>Percent of Families Below Poverty Level</td>
<td>6.8</td>
<td>5.6</td>
<td>10.8</td>
<td>8.3</td>
<td>9.2</td>
</tr>
<tr>
<td>Percent of Population over 25 with Bachelor's Degree or Higher</td>
<td>23.6</td>
<td>26.3</td>
<td>14.8</td>
<td>31.0</td>
<td>24.4</td>
</tr>
</tbody>
</table>

* Census 2000 Summary File 3 – Median Value (Dollars) For All Owner-Occupied Hosing Units (http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml#none Accessed May 9, 2012)
The data in the following tables were generated from the survey responses of planning process committee members in the four cases study jurisdictions.

### Table VI.2: Committee Member Experience

<table>
<thead>
<tr>
<th>Experience</th>
<th>Brevard County (n=24)</th>
<th>Martin County (n=6)</th>
<th>Onslow County (n=7)</th>
<th>New Hanover County (n=20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1 year</td>
<td>2 (8%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>1 to 5 years</td>
<td>6 (25%)</td>
<td>1 (17%)</td>
<td>3 (43%)</td>
<td>4 (20%)</td>
</tr>
<tr>
<td>6 to 10 years</td>
<td>4 (17%)</td>
<td>3 (50%)</td>
<td>1 (14%)</td>
<td>2 (10%)</td>
</tr>
<tr>
<td>More than 10 years</td>
<td>12 (50%)</td>
<td>2 (33%)</td>
<td>3 (43%)</td>
<td>14 (70%)</td>
</tr>
</tbody>
</table>

### Table VI.3: Committee Member Skills and Authorities

<table>
<thead>
<tr>
<th>Skills/Authorities</th>
<th>Brevard County (n=23)</th>
<th>Martin County (n=6)</th>
<th>Onslow County (n=7)</th>
<th>New Hanover County (n=18)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authority to distribute funds for mitigation projects</td>
<td>6 (26%)</td>
<td>1 (17%)</td>
<td>1 (14%)</td>
<td>5 (28%)</td>
</tr>
<tr>
<td>Analytical technical skills (GIS, HAZUS)</td>
<td>7 (30%)</td>
<td>0 (0%)</td>
<td>2 (29%)</td>
<td>5 (28%)</td>
</tr>
<tr>
<td>Outreach and/or communications</td>
<td>20 (87%)</td>
<td>6 (100%)</td>
<td>4 (57%)</td>
<td>16 (89%)</td>
</tr>
<tr>
<td>Facilitation, mediation, and/or conflict resolution</td>
<td>16 (70%)</td>
<td>4 (66%)</td>
<td>5 (71%)</td>
<td>8 (44%)</td>
</tr>
<tr>
<td>Regulation drafting and/or interpretation</td>
<td>14 (61%)</td>
<td>3 (50%)</td>
<td>2 (29%)</td>
<td>7 (39%)</td>
</tr>
<tr>
<td>Plan and/or site review</td>
<td>11 (48%)</td>
<td>2 (33%)</td>
<td>3 (43%)</td>
<td>9 (50%)</td>
</tr>
<tr>
<td>Executive or legislative authority for budgeting</td>
<td>6 (26%)</td>
<td>0 (0%)</td>
<td>2 (29%)</td>
<td>3 (17%)</td>
</tr>
<tr>
<td>Executive or legislative authority for rule-making</td>
<td>4 (17%)</td>
<td>0 (0%)</td>
<td>1 (14%)</td>
<td>5 (28%)</td>
</tr>
</tbody>
</table>
Table VI.4: Committee Member Frequency of Participation in Planning Process

<table>
<thead>
<tr>
<th>Frequency of Participation</th>
<th>Brevard County (n=24)</th>
<th>Martin County (n=6)</th>
<th>Onslow County (n=7)</th>
<th>New Hanover County (n=20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily</td>
<td>0 (0%)</td>
<td>1 (17%)</td>
<td>3 (43%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>A Few Times a Week</td>
<td>2 (8%)</td>
<td>1 (17%)</td>
<td>1 (14%)</td>
<td>3 (15%)</td>
</tr>
<tr>
<td>Once a Week</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>--</td>
<td>2 (10%)</td>
</tr>
<tr>
<td>A Few Times a Month</td>
<td>3 (13%)</td>
<td>0 (0%)</td>
<td>1 (14%)</td>
<td>5 (25%)</td>
</tr>
<tr>
<td>Once a Month</td>
<td>5 (21%)</td>
<td>0 (0%)</td>
<td>--</td>
<td>1 (5%)</td>
</tr>
<tr>
<td>Less than Once a Month</td>
<td>13 (54%)</td>
<td>4 (66%)</td>
<td>2 (29%)</td>
<td>9 (45%)</td>
</tr>
<tr>
<td>Never</td>
<td>1 (4%)</td>
<td>0 (0%)</td>
<td>--</td>
<td>0 (0%)</td>
</tr>
</tbody>
</table>

Table VI.5: Land Use-Related Actions Committee Members Working to Implement in 2011

<table>
<thead>
<tr>
<th>Actions working to implement in 2011</th>
<th>Brevard County (n=22)</th>
<th>Martin County (n=6)</th>
<th>Onslow County (n=7)</th>
<th>New Hanover County (n=18)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elevating or acquiring properties in hazardous areas</td>
<td>3 (14%)</td>
<td>1 (17%)</td>
<td>2 (29%)</td>
<td>2 (11%)</td>
</tr>
<tr>
<td>Acquiring land to protect natural mitigation features</td>
<td>6 (27%)</td>
<td>2 (33%)</td>
<td>1 (14%)</td>
<td>6 (33%)</td>
</tr>
<tr>
<td>Developing, adjusting, or administering policies limiting development in hazardous areas</td>
<td>9 (41%)</td>
<td>2 (33%)</td>
<td>5 (71%)</td>
<td>9 (47%)(^1)</td>
</tr>
<tr>
<td>Developing, adjusting or administering setbacks, buffers and other regulations to protect natural mitigation features</td>
<td>8 (35%)(^2)</td>
<td>3 (50%)</td>
<td>2 (29%)</td>
<td>7 (37%)(^3)</td>
</tr>
<tr>
<td>Land use modeling and/or analysis</td>
<td>8 (36%)</td>
<td>3 (50%)</td>
<td>3 (43%)</td>
<td>6 (33%)</td>
</tr>
<tr>
<td>Incorporating hazard mitigation plan into other planning initiatives</td>
<td>13 (57%)(^4)</td>
<td>4 (66%)</td>
<td>4 (57%)</td>
<td>12 (67%)</td>
</tr>
</tbody>
</table>

\(^1\) Nineteen stakeholders responded to this item.
\(^2\) Twenty-three stakeholders responded to this item.
\(^3\) Nineteen stakeholders responded to this item.
\(^4\) Twenty-three stakeholders responded to this item.
Appendix VII

Data Collection Instruments

This appendix includes the data collection instruments used in this dissertation. It includes the survey instrument for local hazard mitigation stakeholders; the semi-structured interview instrument for local hazard mitigation stakeholders; the protocol for analyzing hazard mitigation plans; the protocol for analyzing comprehensive plans; and the R-Script for Quantitative Regression Analysis.
Survey Instrument for Local Hazard Mitigation Stakeholders
[Administered using Qualtrics web-based survey software available through the Odum Institute for Research]

Hazard Mitigation Planning Survey

The survey has ten questions and should take about five minutes to complete. Your responses will be saved each time you move to a new page.

If you need to, you may take a break and return to the survey later by clicking on the link in the email message you received. Simply click on the arrows (>>) shown at the bottom-right of this page. This will take you to the first page of the survey. Once you get started, you can click on the arrows at any time to go forward (>>) or back (<<).

If you have any questions or comments about the survey, please contact me at the email address or phone number shown below.

Thank you very much for your participation!

Sincerely,
Ward Lyles
The University of North Carolina at Chapel Hill
(919)-943-2681
wlyles@email.unc.edu
Title of Study: Stakeholder Network Influences on Local Level Mitigation Planning Outputs

Principal Investigator: Ward Lyles, Doctoral Candidate (wlyles@email.unc.edu, 919-943-2681)
Faculty Advisor: Professor Philip Berke, PhD (pberke@unc.edu, 919-962-4765)

What are some general things you should know about research studies? You are being asked to take part in a research study. To join the study is voluntary. You may refuse to join, or you may withdraw your consent to be in the study, for any reason, without penalty. Details about this study are discussed below. It is important that you understand this information so that you can make an informed choice about being in this research study.

What are the possible benefits from being in this study? Research is designed to benefit society by gaining new knowledge. You may not benefit personally from being in this research study.

What are the possible risks or discomforts involved from being in this study? This study should not pose any direct risks to you and does not ask you to provide sensitive personal information. As part of the survey, you will be asked to identify specific individuals from whom you received information related to hazard mitigation planning. Neither you nor who you identify will be personally named in any reports from the study, but it is possible that someone could deduce who you are or who you identify from the results of the study.

What if you want to stop before your part in the study is complete? You can withdraw from this study at any time, without penalty and skip any question for any reason.

What if you have questions about this study? You have the right to ask, and have answered, any questions you may have about this research. Contact the principal investigator listed above with any questions, complaints, or concerns you may have.

What if you have questions about your rights as a research participant? All research on human volunteers is reviewed by a committee that works to protect your rights and welfare.

If you have questions or concerns, or if you would like to obtain information or offer input, please contact the Institutional Review Board at 919-966-3113 or by email to IRB_subjects@unc.edu and reference the study number: 11-0324.

☐ I consent to voluntarily participate in this research study. (1)
☐ I do not consent to participate in this study. (2)

If I do not consent to partici... Is Selected, Then Skip To If you change your mind and would lik...
Question 1: How many years have you personally been working on hazard mitigation issues?
- Less than 1 year (1)
- 1 to 5 years (2)
- 6 to 10 years (3)
- More than 10 years (4)

Question 2: Which of the following categories best describes your professional skills or specialization?
- Emergency Management (1)
- Land Use Planning (2)
- Geographic Information Systems (3)
- Economic Development, Community Development or Housing Planning (4)
- Engineering (5)
- Law (6)
- Public Health (7)
- Social Services/Social Work (8)
- Business, Management or Economics (9)
- Real Estate, Land Development, or Building Industry (10)
- Agriculture (11)
- Natural Resource Management (12)
- Other (please identify) (13) ____________________

Question 3: We are interested in your participation in the hazard mitigation planning process. Participation can include attending meetings, exchanging emails, reviewing document drafts, and other activities related to developing the plan. In general, how frequently did you participate in the planning process for developing your community's local hazard mitigation plan?
- Daily (1)
- A Few Times a Week (2)
- Once a Week (3)
- A Few Times a Month (4)
- Once a Month (5)
- Less than Once a Month (6)
- Never (7)
Question 4: Over the last year, how often have you referred to your community's local hazard mitigation plan in your day-to-day work?
- Daily (1)
- A Few Times a Week (2)
- Once a Week (3)
- A Few Times a Month (4)
- Once a Month (5)
- Less than Once a Month (6)
- Never (7)

Question 5: Who have you received information from related to mitigating natural hazards in your community? For each person, please type in the individual's first and last name and organization to the best of your ability. If you only remember a name or an organization, please enter what you can remember. Example: Ward Lyles, University of North Carolina at Chapel Hill.

(1)  
(2)  
(3)  
(4)  
(5)  
(6)  
(7)  
(8)  
(9)  

In ADDITION to the people you have just listed, did you receive any information related to mitigating natural hazards in your community from individuals representing any of the following categories? If so, please type in the individual's name and organization to the best of your ability.

Local government (for example, departments, agencies, bureaus or offices)?
- (1)  
- (2)  
- (3)  

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State and/or Federal government (for example, departments, agencies, bureaus or offices)?
(1)
(2)
(3)

Private contractors, academics, or other professionals who consulted on developing the plan?
(1)
(2)
(3)

Non-profit or private sector organizations?
(1)
(2)
(3)
Question 6: Are you working to implement any of the following actions to mitigate natural hazards in your community this year? By this year, I mean anytime during the 2011 calendar year.

<table>
<thead>
<tr>
<th>Action</th>
<th>Yes (1)</th>
<th>No (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elevating or acquiring private properties in hazardous areas (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acquiring land to protect natural mitigation features, such as wetlands and dunes (2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Developing, adjusting, or administering policies limiting development in hazardous areas (for example, zoning code, subdivision regulations, and site review) (3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Developing, adjusting or administering setbacks, buffers and other regulations to protect natural mitigation features (4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land use modeling and/or analysis (for example, GIS/HAZUS) (5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incorporating hazard mitigation plan into other planning initiatives (for example, comprehensive plans, district or site plans, transportation plans and projects) (6)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Question 7: Please indicate how effective you think each of the six following approaches are for mitigating hazards in your community.

<table>
<thead>
<tr>
<th>Approach</th>
<th>Very Effective (1)</th>
<th>Effective (2)</th>
<th>Neither Effective nor Ineffective (3)</th>
<th>Ineffective (4)</th>
<th>Very Ineffective (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property Protection (for example, acquisition, relocation, elevation, and retrofit) (1)</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Natural Resource Protection (for example: floodplain protection, watershed management, dune, beach and wetland preservation, riparian buffers and forest management) (2)</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Prevention (for example, planning, zoning, building codes and open space preservation) (3)</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Structural Projects to Control Hazards (for example: dams, levees, seawalls, reservoirs, channel modification, and beach nourishment) (4)</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Public Education and Awareness (for example, outreach projects, maps, real estate disclosure, library and web materials, and school education programs) (5)</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Emergency Services (for example, warning systems, evacuation and sheltering planning and emergency response training) (6)</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
</tbody>
</table>
Question 8: In this question, we would like to know about your general opinions about government and society. How much do you agree or disagree with the following statements?

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Agree (1)</th>
<th>Agree (2)</th>
<th>Neither Agree nor Disagree (3)</th>
<th>Disagree (4)</th>
<th>Strongly Disagree (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protecting the private rights of individual citizens is the most</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>important role of government. (1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>There are too many government regulations on development and growth. (2)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>You can usually trust the government to do what is right. (3)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

Question 9: Do you bring the following skills or resources to the local hazard mitigation planning process?

<table>
<thead>
<tr>
<th>Skill/Resource</th>
<th>Yes (1)</th>
<th>No (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authority to distribute funds for mitigation projects (1)</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Analytical technical skills (for example, Geographic Information Systems and/or HAZUS) (2)</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Outreach and/or communications (3)</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Facilitation, mediation, and/or conflict resolution (4)</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Regulation drafting and/or interpretation (5)</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Plan and/or site review (6)</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Executive or legislative authority for budgeting (7)</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Executive or legislative authority for rule-making (8)</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Other (9)</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

Question 10: A 'champion' of hazard mitigation is someone who is very effective in promoting hazard mitigation as an important issue to elected officials and the general public in their community. Please name any individuals who you would identify as a 'champion' in your community.
community. Please include the individual(s) first and last name(s) and the organization(s) they represent in mitigation efforts.

Please feel free to add additional comments you have about hazard mitigation planning in your community or any other thoughts related to the questions in this survey.

Would you like to be included in the drawing for a copy of "Hazard Mitigation: Integrating Best Practices into Planning?"

☑ Yes, please include me in the drawing. (1)
☑ No, please do not include me in the drawing. (2)

If Yes, please include me in t... Is Selected, Then Skip To End of Survey, If No, please do not include m... Is Selected, Then Skip To End of Survey

If you change your mind and would like to return to complete the survey at a later date, you may do so. Thank you for your time.
If If you change your mind and... Is Displayed, Then Skip To End of Survey
Semi-Structured Interview Instrument for Local Hazard Mitigation Stakeholders
[Customized for each interviewee as indicated within brackets]

**Stakeholder Network Influences on Local-Level Hazard Mitigation Planning Outputs**

Interview Questions for [Insert name of subject here]

Conducted by

*Ward Lyles*

*Doctoral Candidate*

*University of North Carolina at Chapel Hill*

Supported by

*PERISHIP Fellowship*
I am conducting a study of local hazard mitigation planning in coastal states, including case studies in selected counties in Florida, Georgia and North Carolina. The purpose of the study is to assess the influence of the networks of stakeholder involved in hazard mitigation planning processes on the quality of the hazard mitigation plan and its implementation. This project is funded by a PERISHIP fellowship, which is supported by the National Science Foundation and Swiss Re. My dissertation studies are supported by a Royster Fellowship from the Graduate School at the University of North Carolina at Chapel Hill.

As a key stakeholder involved in hazard mitigation planning in [insert county] your expertise is highly valued. I am interested in your participation in hazard mitigation planning efforts. Below you will find some of the questions I will ask in our interview on [date]. If you consent, I will tape record and take notes during the interview, so writing detailed answers to these questions in advance of the interview is unnecessary. However, please do take a few moments to read through the questions and give them some thought in advance of the interview. I have left room under each question in case you want to jot down notes beforehand.

Your participation in this interview is entirely voluntary and all of your responses will be kept confidential. You can choose not to answer any question you do not want to answer, or you can stop your participation at any time. Your answers will not be associated with any personally identifiable information in any reports of the data. This study has been reviewed and approved by the University of North Carolina Institutional Review Board, and if you have any questions about your rights in this study, you may contact them at 919-966-3113. The IRB study reference number is 11-1830.

If you have questions about the interview or research study, please feel free to contact us:

**Phone:** 919-943-2681
**Email:** wlyles@live.unc.edu
Hazard Mitigation Stakeholder Network Questions

Can you begin by talking about who you work with most closely on hazard mitigation?

Potential probes (not included in copy sent to respondent):

Are there other people that you work with less frequently but that you consider important to your mitigation efforts? Can you speak to why they are important but that your contact is less frequent?

Are there any individuals or groups that you feel should be more involved in hazard mitigation but are not?

Prompt about specific groups if not mentioned:
- Local planners
- Emergency managers
- Consultants
- Elected officials
- Developers
- Environmental or neighborhood groups
- State and federal officials?

I’m curious about how you see yourself in the hazard mitigation network. Do you see yourself as being in a very central position or more on the edge or periphery?

Potential Probes:

Centrality:
If yes: how did you come to be in a central position?

If not, who do you see as that person? Would you describe that person as a champion, someone very effective in promoting hazard mitigation planning in your community? If not, is there someone else who serves as the champion?

How would you describe the integration of local planners, zoning officials and others focused on land use issues? Are they central or peripheral?

Is there anyone that is on the edge or periphery of the network that should be more central? What are reasons that they are not as central as they maybe should be?

Do you see yourself as serving as a bridge between different groups involved in hazard mitigation?

Potential Probes:

Bridging:
If yes: who are you a bridge between? Fed-State-County-Municipal? Agency types within jurisdiction? How did you come to be in that position?
If not, are there any people that serve as key bridges in the network?
Role of planners:
Are there bridges to land use-oriented stakeholders?

We’ve talked about your connections to other stakeholders and different positions in the network. Next, I’d like you to please think a bit more broadly about the full network of people involved in hazard mitigation planning in [insert] county. Would you describe the network as large or small?

Potential probes (not included in copy sent to respondent):
Is it large, medium, small? Is that size effective? How so? (If large, is it too big and unwieldy; if small, is it too insular)

Well connected or disconnected?
Potential probes (not included in copy sent to respondent):

Do most people in the network know each other and work together often or are the connections pretty weak?

Are there key groups that are disconnected from each other?

If disconnected, is that a problem or an asset?

Is the network highly dependent on one or a few people that link everyone else together? (Would you expect it to fall apart if that person left their position?) If highly dependent on one person, is that a problem or an asset?

**Active or inactive?**

Potential probes (not included in copy sent to respondent):

Do people only come together to develop the plan every few years and maybe monitor it once a year or are people working together on an ongoing basis?

If inactive, is that a problem or an asset?

**How did the [insert] county hazard mitigation network develop in the first place?**

Probes (not included in copy sent to respondent):

Did it develop in response to the DMA 2000 requirement for a plan? In response to a previous federal or state program (e.g. LMS or Project Impact or CAMA planning?)

**How has it evolved over time?**

Probes (not included in copy sent to respondent):

Has the network change over time? Has it gotten larger or smaller? More or less disconnected? More or less diverse in terms of types of people involved?

Is it getting more or less effective over time?

**The last network question focuses on the hazard mitigation planning process. Could you briefly describe the roles of each of these groups in the hazard mitigation planning process: emergency managers, land use planners, consultants, elected officials? Are there any other groups that played major roles?**
**Implementation Questions:**

**What, if any, hazard mitigation actions are you currently working to implement?**

Probes (not included in copy sent to respondent):  Who are you working with to implement it?

**Does your community use land use approaches to mitigate hazards? If so, can you please describe those efforts and your involvement?**

Probes (not included in copy sent to respondent):  Who has been mainly responsible for promoting and implementing these approaches?

Are there land use related actions you’d like to be working but are not? If so, what is preventing or slowing progress? Lack of funding, staffing political support, etc.?

Are there land use actions that are taking place outside the hazard mitigation planning context that are beneficial to risk reduction? Why are those activities not more explicitly integrated with hazard mitigation efforts?

What are the major obstacles to implementing land use related actions in your community? Lack of political support, lack of funding, lack of attention by public, weak network?

Is there conflict between development/pro-growth interests and environmental/neighborhood interests in relation to land use approaches to mitigation?

**Can you update me on the progress made on the following action included for your community in the [county] plan? Are they completed, in progress, not yet started, or eliminated? [insert list of actions from hazard mitigation plan, focusing on land use related actions and actions the subject is designated as being responsible for]**

Probes (not included in copy sent to respondent):  For selected actions: what do you see as major factors for that level of progress?

**Additional Implementation Probes**

Probes (not included in copy sent to respondent):

Are there any actions that were not included in the plan that you are working on?

Are there actions you’d like to be working but are not? If so, what is preventing or slowing progress? Lack of funding, staffing political support, etc.?

More generally, what are the major obstacles to implementation you face in your community? Lack of political support, lack of funding, lack of attention by public, weak network?
What type of actions are most effective? Are there any success stories you can reference? Any losses avoided?

How do you use the plan when you use it? What would make it more useful?

Is there competition between different groups about which actions get included in the plan and get implemented?

At the end of the interview:
I appreciate you taking time out of your schedule to speak with me. After I go over my notes and the recording of the interview and begin analyzing the data, is it all right if I contact you again if I have addition question or require clarification
Protocol for Analyzing Hazard Mitigation Plans

[The qualitative data generated using this protocol was used to complement the quantitative data from the content analysis of 175 local mitigation plans.]

Networks
• Review the participation section of the plan
  o Are local planners involved? If so, what positions do they hold, what agencies do they represent, and how were they involved in the planning process?
  o Are there any notable aspects of the planning process (e.g. focus groups, multiple stakeholder meetings, surveys of local stakeholders)
• Review the meeting minutes, if included
  o Were local planners at meetings? Did they actively participate? What did they say?

Land Use-Hazards Integration
• Review Hazard Assessment
  o Is there a narrative description of local land use patterns and/or environmental assets?
  o Is there a zoning map or other land use-related map?
  o Are the tables with land use related information?
• Review Capability Assessment, if included
  o Are land use related capabilities assessed? Which ones? In what detail?
• Review Mitigation Strategy
  o Are land use related actions proposed? Which ones? What language is used? What level of commitment?
  o Is implementation information included (e.g. responsible agency, timeline, spatial specificity, cost)
• Review Monitoring and Updating section
  o Are there descriptions of how hazard mitigation actions will be coordinated with land use related actions? In what detail?
Protocol for Analyzing Comprehensive Plans

Networks
- Review the participation section
  - Are emergency managers involved? Is so, what positions do they hold, what agencies do they represent and how are they involved?
  - What about other types of stakeholders (public health, public works, etc.)
  - Are there any notable aspects of the planning process (e.g. focus groups, multiple stakeholder meetings, surveys of local stakeholders)

Land Use-Hazards Integration
- Review Vision and Goals section
  - Are there hazard related goals and visions? Do they relate to sustainability and/or resilience?
- Review Hazard Elements (e.g. coastal management)
  - Is there a hazard-related element?
  - What are its fact base components? Hazard identification? Vulnerability and risk assessments? Capability assessments?
  - Are the hazard-related policies, programs or actions proposed?
- Review other Elements with strong potential for hazard connections (e.g. Environment/Open Space, infrastructure)
  - Is there hazard related content? In the fact base? In the policies? What is the nature of the content?
R-Script for Quantitative Regression Analysis

# File Assessing Influence of Local Planners on Incorporation of Land Use In Hazard Mitigation Plans
# Ward Lyles
# Final Version Used in Dissertation Chapter 6 Analysis
# Started May 2011; Revised 2011 into April 2012

#############################################################
# Set Up Directory, Install Packages, and Load Data
#############################################################
setwd("/Users/wlyles/Phd/Dissertation/PlanQualityData")
library(car)
library(MASS)
library(VGAM)
library(lmtest)
library(quantreg)
library(ltm)
library(multilevel)
data <- read.csv("PQ_Planner_Controls_Data_Rv4.csv")
data2 <- read.csv("CACronbach.csv")

#############################################################
# Regression Models Predicting Land Use in Capability Assessment
# Fact Base Principle of Plan Quality
# CAIndex index variable (possible range 0.0000 to 16.0000) treated as continuous variable
#############################################################

# Cronbach Alpha - test using functions from two different packages
cronbach.alpha(data2)
cronbach(data2)

# Primary Model - Ordinary Least Squares
modelCA.OLS <- lm(CAIndex ~ ThreeLevelMandate + PlannerCategorical + SCGroups + log(PopDensity2000) + NumberPre sDecDisMajorDisaster + PopGrowth10YrsPrior + MedianHouseValue, data)
summary(modelCA.OLS)

# Use Residuals to Check for Heteroskedasticity
residsCA <- residuals(modelCA.OLS)
order(residsCA)
resids[order(residsCA)]
plot(residuals(modelCA.OLS))
bptest(modelCA.OLS)
# Test for Multi-Collinearity
vif(modelCA.OLS)

# Secondary Model to Check Robustness - Median Regression
fit2 <- rq(CAIndex ~ ThreeLevelMandate + PlannerCategorical + SCGroups + log(PopDensity2000) + NumberPresDisMajorDisaster + PopGrowth10YrsPrior + MedianHouseValue, tau = 0.5, data = data)
summary(fit2, se = "nid")

# Regression Models Predicting Land Use in Mitigation Strategies
# Policies Principle of Plan Quality
# PACount is count variable of 16 possible land use actions

# Primary Model - Poisson
modelPA.POI.JP <- glm(PACount ~ ThreeLevelMandate + PlannerCategorical + SCGroups + log(PopDensity2000) + NumberPresDisMajorDisaster + PopGrowth10YrsPrior + MedianHouseValue, data, family="poisson")
summary(modelPA.POI.JP)

# Use Residuals to Check for Heteroskedasticity
residsPA <- residuals(modelPA.POI.JP)
order(residsPA)
residsPA[order(residsPA)]
plot(residuals(modelPA.POI.JP))

# Secondary Model to Check Robustness - Median Regression
fit1 <- rq(PACount ~ ThreeLevelMandate + PlannerCategorical + SCGroups + log(PopDensity2000) + NumberPresDisMajorDisaster + PopGrowth10YrsPrior + MedianHouseValue, tau = 0.5, data = data)
summary(fit1, se = "nid")

# Regression Models Predicting Implementation Information For Land Use Actions
# Implementation Principle of Plan Quality
# ImpCount is count variable of 48 possible piece of implementation information
# Primary Model - Poisson
modelImp.POI <- glm(ImpCount ~ PACount+ThreeLevelMandate+PlannerCategorical+SCGroups+NumberPresDecDisMajorDisaster+log(PopDensity2000)+PopGrowth10YrsPrior+MedianHouseValue, data, family="poisson")
summary(modelImp.POI)

# Use Residuals to Check for Heteroskedasticity
residsIMP <- residuals(modelImp.POI)
order(residsIMP)
residsIMP[order(residsIMP)]
plot(residuals(modelImp.POI))

# Secondary Model to Check Robustness - Median Regression
fit3 <- rq(ImpCount ~ PACount+ThreeLevelMandate+PlannerCategorical+SCGroups+NumberPresDecDisMajorDisaster+log(PopDensity2000)+PopGrowth10YrsPrior+MedianHouseValue, tau=0.5, data = data)
summary(fit3, se ="nid")

# Bivariate Regression to estimate influence of proposed actions on implementation information
fit4 <- lm(ImpCount ~PACount, data)
summary(fit4)
References


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Martin County. 2010. Martin County Unified Local Mitigation Strategy.


