A THEORETICAL FRAMEWORK FOR SOCIAL CAPITAL ASSESSMENT
FOR SHORT-AND LONG-TERM POST-DISASTER RECOVERY: A CASE
STUDY OF MANATEE COUNTY, FLORIDA


A Dissertation

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By:

Aparna Kumari


Major Professor: Karen Humes, Ph.D.

Committee Members: Raymond Dezzani, Ph.D.; Graham Tobin, Ph.D.;

Raymond Tutu, Ph.D.

Department Administrator: Raymond Dezzani, Ph.D.


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# Authorization to Submit

This dissertation of Aparna Kumari submitted for the degree of Doctor of Philosophy with a
major in Geography and titled "A theoretical framework for social capital assessment for
short- and long-term post-disaster recovery: A case study of Manatee County, Florida," has
been reviewed in final form. Permission, as indicated by the signature and dates given
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Major           _____      Date: _____

Professor       Karen Humes, Ph.D.


Committee     _____      Date: _____

Members       Raymond Dezzani, Ph.D.


                   _____      Date: _____

                   Graham Tobin, Ph.D.


                   _____      Date: _____

                   Raymond Tutu, Ph.D.


Department    _____      Date: _____

Administrator   Raymond Dezzani, Ph.D.

# Abstract

This research incorporates structuration theory to define social capital and develop a social capital framework to evaluate the network structures of recovery stakeholders, factors that influence the capabilities of structural social capital, and existing reliance on social capital for disaster response, and recovery. Research in Manatee County, Florida sought to: 1) to evaluate existing hazards plan of Manatee County to understand role of social capital in the recovery process, 2) model social network of recovery stakeholders to understand structure and position of stakeholders into decision making process, 3) analyze opportunities and constraints for incorporating structural social capital into disaster recovery process. The evaluation of hazards plan of Manatee County indicate that plans are more focused on fact-based elements, with a limited incorporation of social capital. Modeling results indicate that Manatee County follows a more centralized network pattern, core stakeholders are comprised of governmental institutions with local social capital rich institutions are being peripheral in the recovery planning and decision-making process. Results also indicate that the capabilities of social institutions of Manatee County are low for factors such as fund, staff availability, network of agencies, formalized collaborative planning, and standardized training of non-governmental institutions. In the end, this research demonstrates that there is a need to address the role of social capital in disaster recovery process by evaluating existing hazards plans in that context, analyzing the social network of recovery stakeholders, and examining the capabilities of social institutions involved in the recovery process.

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## 1.1 Introduction

Coastal region across the globe are densely populated and vulnerable to various types of hazards, including hurricanes, flooding, tropical storms, tsunami, and sea level rise (Wu et al. 2002; Wisner et al., 2004). Societal impacts from hazards continue to escalate globally. The impact a physical hazard has on an individual, family, community, region, or nation is partially a result of social factors that contribute to disaster response and recovery process (Tobin and Montz 1997; Berke et al. 1993; Quarantelli 1999; Wisner et al. 2004; Cutter et al. 2006). Social factors such as the role of social capital has been considered an important component to enhance resilience and facilitate a more equitable and efficient disaster recovery process (Mileti 1999; Tobin 1999; Aldrich 2011; Wood et al. 2013).

Resilience is a multidimensional concept and can be defined as the ability and capacity of a system to respond and recover from a disaster, including the ability to absorb impacts, cope with and adapt to an event (Rose, 2007; Cutter et al. 2008). A community's resilience is heavily influenced by the community's social capital and vulnerability of the community to hazards. Social capital could be analyzed as a means to enhance community resilience by addressing the most vulnerable populations (Adger et al. 2005; Gallopin 2006; Cutter et al. 2008; Cutter e t al. 2010). In order for community resilience to be enhanced to a natural hazard, social vulnerability must be reduced. Vulnerability is defined as the potential for loss (Cutter et al. 2003; Turner et al. 2003; Adger 2006; Hufschmidt 2011). Vulnerability is broadly divided into physical and social vulnerability (Turner et al., 2003; Wisner et al. 2004; Adger 2006). Social vulnerability arises out of complex interactions between human-

environment systems and is the product of complex social system and social capital (Morrow 1999; Turner et al. 2003; Wisner et al. 2004; Adger 2006; Cutter and Emrich 2006). Socially marginalized people are often more vulnerable, typically have low access to resources (social capital) and are slower to recover from disasters (Morrow 1999; Turner et al. 2003; Wisner et al. 2004; Mileti and Gailus 2005; Cutter et al., 2006; Cutter and Emrich 2006).

In hazards and climate change literature, social capital is often identified as a significant component to enhance individual and community resilience and facilitate disaster recovery (Adger 2003; Pelling and High 2005; Colten et al. 2008; Colten and Stumper 2009; Tutu 2013). However, a theoretical assessment of social capital has been given minimal attention among popular vulnerability and resilience frameworks for the purpose of facilitating disaster recovery. Hazards literature typically has limited incorporation of theoretical grounded structural approach to understand the interdependence of human agency and social structure, and differential response to disaster recovery among diverse socio-economic populations (Bogard 1998; Mohan and Mohan 2002; Pelling and high 2005). Also, there is a limited inclusion of theoretical grounding to understand the complex nature of social capital. For instance, the dynamic nature of social capital such as how "social capital can be created (or destroyed) by structural forces and institutions" is not fully explained in the hazards literature (Mohan and Mohan 2002, 195; Murphy 2007). Additionally, efforts to identify and enhance social capital are often absent in traditional hazards plans. Hazards Plans routinely neglect the role unique community characteristics or social systems, like social capital, have on pre-event mitigation and post-disaster recovery.

Given these existing limitations in the literature, this research seeks to develop a theoretical framework that includes social capital to facilitate the disaster recovery process. This dissertation uses Manatee County, Florida as a case study for the assessment of social capital. This study develops a conceptual framework of social capital and applies social capital framework to evaluate existing hazards plan, model social network of stakeholders, and analyzes dynamics of structural social capital of institutions. Evaluating and assessing social capital can assist in obtaining an insight into the ways communities may prepare for and respond to disasters. This chapter discusses the theoretical framework of social capital by incorporating structuration theory and explains how social capital framework contributes to analyze the interdependence of social structure and human agencies. It also presents a brief literature review on the role of social capital in disaster recovery, research goals and questions, and a brief dissertation structure.

**1.2 A theoretical framework for social capital assessment**

Social capital is a multidimensional concept and the concept has been applied in many various contexts in different disciplines. Social capital is difficult to define and analyze because it has a plurality of definitions that has created conceptual fuzziness and lack of a singular perspective (Portes and Landolt 1996; Pelling and High 2005; Holt 2008). However, among different disciplines there is a consensus that social capital is a resource embedded in social networks and social structure, which can be used and mobilized by actors (Woolcock and Narayan 2000; Lin 2001; Dynes 2005). In general terms, social capital describes how any social units such as people, neighborhood, community, and institutions interact with each other as well as the effects of those interactions or relationships. Social capital incorporates a diverse range of phenomena such as social norms, trust, institutions, culture, and social

networks/resources of interpersonal relationship (Lin 2001; Mohan and Mohan 2002; Dynes 2005; Sabatini 2009; Chamlee-Wright and Storr 2011).

The term social capital was made popular by Bourdieu (1986), Coleman (1988), and Putnam (1995); they defined social capital as an important component of collective action aimed at developmental change. Coleman (1988) was one of the pioneers to explicitly incorporate social theories to explain the concept of social capital. He explained, "social capital lies in the structure of relations between actors and among actors" (Coleman 1988, 90). Social relations and social structure help to form social capital between and among actors for mutual benefits. Another common definition offered by Putman et al. (1995, pp. 664-665) is that social capital describes the "features of social organizations such as trust, norms, and networks that can improve the efficiency of society by facilitating coordinated actions". Putman's (1995) work in "*Bowling Alone*" emphasized the importance of social networks as indicators as well as the process that forms the social capital within a social system.  Other renowned sociologists, Lin (2001) and Dynes (2005) also explained the importance of social structure and social networks to access and mobilized the resources within a social system.

Similarly, the concept of social capital also gained prominence from the disciplines of economics, political science, health, and management. Social capital has also been analyzed in terms of human capital by famous economist Paul Romer (1994, 1989). Social capital has been defined in terms of bridging, bonding, and linking social capital Bonding and bridging social capital explains the horizontal relationships that exist between and among communities, whereas linking social capital explains the vertical relationships that analyze the power dynamism among and between communities and institutions (Woolcock and Narayan 2000; Adger 2003; Airriess et al 2007; Hawkins and Maurer 2010). Social capital has also been

categorized into three interrelated dimensions: cognitive, structural, and relational (Burt 1992; Granovetter 1992; Nahapiet and Ghosal 1998; Uphoff 2000). The structural social capital explains the tangible structural elements of the community such as social network, participation, organizations, rules, and procedure whereas relational and cognitive social capital refers to the intangible elements of community such as norms, trust, reciprocity, behavior, relations, shared narrative, and knowledge. Furthermore, the concept of social capital can be applied to different units of analysis (individual, household, community, and regional level) (Nahapiet and Ghosal 1998; Uphoff 2000; Murphy 2007). Analyzing structural, cognitive, and relational social capital can help to understand community social structure and community capabilities to deal with hazard events. Examining structural social capital can help to build a well-integrated social network and organizations to make informed decisions, facilitate communications during emergency response periods, and create better response and recovery strategies. Table 1.1 shows some important definitions of social capital in the social science literature.

**Table 1.1: Definition(s) of Social Capital (Literature Review)**

| Source(s) | Definition(s) | Discipline(s) | Perspective(s) |
|---|---|---|---|
| Bourdieu (1985) | the aggregate actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual recognition | Sociology | Classical theory |
| Coleman (1988) | defined by its function. variety of different entities, with two elements in common: they consist of some aspect of social structures, and they facilitate certain actions of actors-within the structure | Sociology | Structural social theory |
| Putnam (1992) | features of social organizations such as trust, norms and networks that can improve the efficiency of society by facilitating coordinated actions | Political Science | Neo-liberal theory |
| Burt (2000) | examines the network structures of organization and society | Management | Social theory |
| Woolcock and Narayan (2000) | refers to the norms and networks that enable people to act collectively | Economics | Development theory |
| Lin (2001) | defined as resources embedded in a social structure which are accessed and/or mobilized in purposive actions | Sociology | Social resource theory |
| Dynes (2005) | refers to aspect of social structures, which ae of value to social actors as resources that can be mobilized in pursuit of their interests | sociology | Social theory |
| Chamlee-Wright and Storr (2011) | resource that facilitates collective action for mutual benefit | sociology | Social resource theory |

Theorization of social capital primarily comes from sociology and is further

expanded in other social science disciplines (Bogard 1988; Castiglione et al 2008). Seminal

work of sociologists Bourdieu 1986; Bogard 1998; Coleman 1998; Morrow 1999; Lin 2001;

Dynes 2005 for example, have helped to understand the theoretical basis of social capital

and the role of social structure and social networks in pre-event planning and post-disaster recovery. Social capital theory is diverse in nature and encompasses different perspectives. Social theories such as political economy/ecology and structuration theory help us to understand the underlying spatio-temporal dimensions of the social structure and social process. Social capital has been defined and analyzed by using several social theories, - this research primarily utilizes structuration theory to analyze social capital.

Structuration theory is propounded by Anthony Giddens (1986), to understand the relation of human actions and social structure. Structuration theory explains the synthesis of social structure and human agency. The central element of the theory is that it explains the duality of the structure based on the premise that human action and structure are interdependent, recursive, and dynamic, which is defined as the process of structuration (Giddens 1986; Bogard 1988; Mohan and Mohan2002). The structuration process depends upon the rules (social norms), resources, and shared knowledge for the creation or re-creation of a social system (Giddens 1986). The theory explains that both agency, which is defined as individual or collective actions and social structure have the power, legitimations, and significance to create and function for the overall social system. Structuration theory also explains that place is dynamic and contingent upon the outcome of the interactions between agency and structure (Giddens 1986; Mohan and Mohan 2002). The theory provides an explanation to understand the structural dimensions about the distribution of power and resources in a society (Bogard 1988; Hardcastle et al. 2005).

Similarly, social capital, by its definition, exists to achieve an individual or collective goods with the help of interactions of any social units facilitated through social network and relations, which impact the overall social system of a community (Fukuyama 2001; Mohan

and Mohan 2002; Adger 2003; Murphy 2007). Social capital explains the dynamic nature of society. Different aspects of structural, cognitive, and relational social capital including social relations, social networks, community participation, social organization, and shared narratives and knowledge can increase or attenuate the impact of a hazard events. Social capital is a resource, which can create and reproduce by the interdependence of human agency and social structure (Bogard 1988; Lin 2001; Mohan and Mohan 2002). The cognitive, structural, and relational dimensions of social capital can help to understand how behavior, level of trust, and reciprocal activities of human agency can form and constrain the existing structural process and how structure can affect these attributes of human agency. Incorporating the role of social capital within the context of hazards plans and the recovery process is beneficial because hazards are recurring and dynamic events and their effects on society are impacted by the interdependence of human agency and social structure (Mohan and Mohan 2002; Adger 2003; Pelling and High 2005). Pelling and High (2005) examined the role and importance of social capital to understand the social attributes that facilitate the collective actions for recovery and adaptation. They explained that social capital is a dynamic process and facilitated by individual and collective actions to achieve a common good. Adger (2003) put emphasis on the structural approach to explain the concept of social capital. He illustrated the importance of understanding the interdependence between social capital and state for the access and mobilization of resources during a hazard event.   In hazards literature, interdependence of structure and agencies has not been thoroughly analyzed to understand factors that influence the capacities of structural social capital, and social network of stakeholders who are involved in the recovery process. This research develops a social capital framework to evaluate the network structures of agencies,

dynamics of structural social capital of institutions, and existing role of social capital into hazards plan and recovery process. Figure 1.1 explains the conceptual framework of social capital.
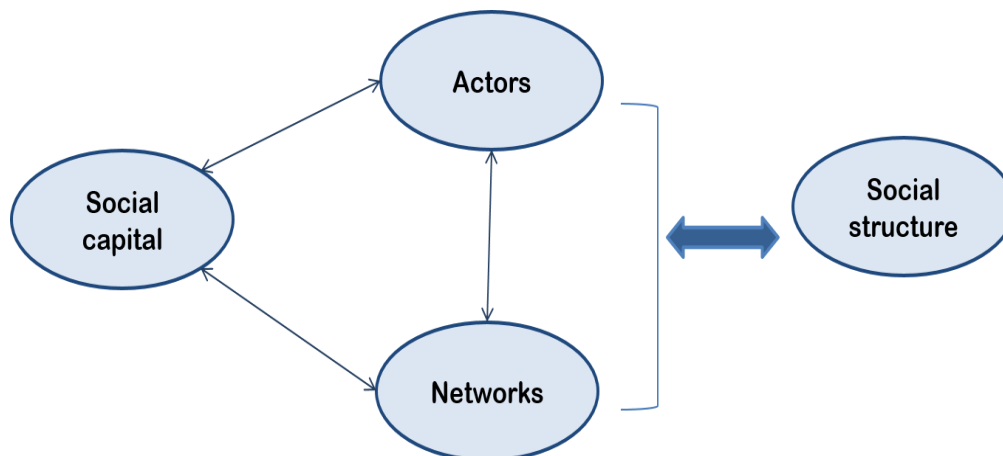


**Figure 1.1: Conceptual Framework of Social Capital (based on Structuration Theory, Literature review)**

The conceptual framework of social capital for this research has incorporates two interrelated components of social capital - social actors (stakeholders and institutions) and their social networks and how social capital affects and get affected by the overall social structure of the system. Based on the above-mentioned theory and social science literature, this research defines social capital as dynamic resources, which exist within the social structure of agencies, communities, and institutions, and can be mobilized by social actors. Social capital within a social system can be constructed, destroyed, and reconstructed by existing social structure and social process. The conceptual framework developed by this research provides a broader perspective in hazards study to analyze stakeholders and social institutions who are involved in the recovery process, and overall social structure of the existing social institutions. This research analyzes social capital to understand the role of

social structures and human agents/institutions that can increase or attenuate the disaster recovery process and community resilience from extreme natural events.

## 1.3 Role of social capital in disaster recovery

Social capital has gained prominence in disaster literature recently. In hazards and climate change literature, social capital has been defined and analyzed primarily in terms of social networks (vertical and horizontal), formal and informal institutions, socio-economic inequality, community participation, strong leadership, shared narratives, social trust and norms (Pelling 1998; Adger 2003; Pelling and High 2005; Cutter et al. 2006; Airriess 2007; Colten et al. 2008; Chamlee-Wright and Storr 2011; Jones et al., 2012; Tutu 2013). Social capital can be categorized both at individual and community or group level. Social capital can have a positive impact both at the individual level (promoting better health, social interaction, assess of resources) and at the community' level (promoting social network, strong sense of community, availability of resources (Lin 2001; Mohan and Mohan 2002). However, social capital can be detrimental to community development. For instance, gangs that may have strong social ties and networks that do not lead to the enhancement of society (Mohan and Mohan 2002; Murphy 2007). Therefore, sometimes it is difficult to scale the impact of social capital for disaster recovery and community resilience.

Further, role of social capital as resources has also not been recognized in the emergency response team and in the planning process (Dempwolf and Lyles 2012; Kwok et al. 2019). How absence of social capital can affect the capabilities of institutions who are involved in the response and recovery process has not been thoroughly analyzed. Lack of coordination among diverse stakeholders including emergency managers, community planners, non-governmental organizations, and other institutions diminishes the capabilities

of stakeholders to deal with emergency response and recovery (Drabek 1985; Portes 1998; Mileti 1999; Mileti and Gailus 2005; Castiglione et al. 2008). Enhancement of social capital to facilitate recovery process needs efficient communications and cooperation of multiple stakeholders (Kwok et al. 2019; Lyles and Smith 2014).

Social capital is important for disaster recovery. Differential rate of disaster recovery has been seen as the product of a lack of pre-disaster planning, role of social capital in terms of access and mobilization of resources, limited capabilities of institutions and uncoordinated activities of agencies (Haas et al. 1977; Berke et al. 1993; Quarantelli 1999; National Research Council 2006, Smith 2011). A holistic disaster recovery process and hazards plan needs to include both structural and non-structural measures, such as social capital for the community development (Berke et al. 1993; Mileti 1999; Tobin 1999; Burby et al. 2000; Tierney and Smith 2012; Frazier et al. 2013). The hazards literature recognizes the importance and role of individual and community social capital to facilitate both short- and long-term disaster recovery. Various facets of social capital, such as patterns of social interactions, social networks, social organization, community participation, and shared knowledge and narratives have been identified as crucial for the immediate response, rescue, reconstruction, and redevelopment process (Cutter et al. 2006; Nakagawa and Shaw 2004; Adger et al. 2005; Pelling and High 2005; Airriess et al 2007; Colten et al., 2009; Aldrich 2011; Smith and Boruff 2011). However, to the knowledge of this researcher, a comprehensive theoretical framework of social capital, which includes interdependence of human agency and social structure has not been designed to assess how social capital can impact differential rate of recovery within diverse populations.

Social capital is seen as a complex and, hard to discern, but it is crucial for the disaster recovery process. It is also an important element for the reduction of social vulnerability and to assist to create resilient communities (Morrow 1999; Tobin1999; Nakagawa and Shaw 2004; Dynes 2005; Cutter and Emrich 2006; Cutter et al. 2006; Murphy 2007; Colten et al. 2008). Some individual studies illustrate the importance and role of individual and community social capital to facilitate the disaster recovery process (Cutter et al. 2006; Nakagawa and Shaw 2004; Airriess et al 2007; Colten et al., 2009, Aldrich 2011; Smith and Boruff 2011). Lopez-Marrero and Tschakert (2011) discussed the importance of social capital (including bonds of trust, reciprocal relationships, and collective actions, social learning) as a key source of resilience. They emphasized that networks (both horizontal and vertical), stakeholder's and institution's collaborations, create opportunities for a more efficient recovery process (Lopez-Marrero and Tschakert 2011). Airriess et al., (2007), analyzed the role and importance of multi-scaled co-ethnic social networks to explain the evacuation, relocation, and recovery experiences of a Vietnamese American Community in New Orleans, Louisiana in the aftermath of Hurricane Katrina. They emphasized the importance of the bottom-up approach to construct social networks at various scales (household, local, regional) for the community recovery process. This research also briefly mentions the importance of a structural approach in social capital and role of religious institutions to facilitate disaster recovery process.

Colten and Stumper (2009) analyzed the importance of community involvement in the decision-making process and resource allocation to build post-disaster resilience and recovery. Pelling (1998) highlighted the importance of social capital (quality of social cooperation and organizations) as a means of coping strategies for disaster recovery and preparedness. Aldrich (2011) outlined the importance of social capital to facilitate post-

disaster recovery by analyzing the 1995 Kobe earthquake in Japan. A comparison between two similar neighborhoods within Kobe during and after the quake illustrated how stronger social networks can accelerate recovery (measured by population growth) after a disaster. Social capital, measured by the number of non-profit relief organizations, was shown to be the most important component in population recovery. Nakagawa and Shaw (2004) conducted case studies in four different communities of Gujarat to understand the role of socio-economic and cultural settings in disaster recovery. They found that communities with high social capital, especially strong leadership, and strong social networks (vertical and horizontal), to be the most effective elements in enhancing collective actions and disaster recovery.

Frazier et al., (2013) in their article, highlighted the importance of community involvement in the disaster recovery process. Wood et al. (2013) analyzed the role of social capital in terms of bridging, bonding, and linking network for the long-term recovery in two Western Australian Communities. Role of informal networks and local agencies has been found crucial for the dissemination of information and better co-ordination and communication for the restoration and redevelopment process after the hazard event. As such, social capital has been identified as one of the most important explanations for differential preparedness, response, and recovery to Hurricane Katrina in New Orleans and along the Mississippi Gulf Coast (Cutter et al., 2006; Cutter and Emrich 2006, Colten et al. 2008), and other hazard events such as Kobe earthquake (Aldrich 2011), Indian Ocean tsunami (Munasinghe. 2007).

Role of social capital as social networks has also seen as an important component for an efficient disaster recovery process. Bridging, bonding, and linking social networks has been analyzed as a means to facilitate disaster recovery process (Woolcock and Narayan 2000;

Airriess et al. 2007; Adger 2003). Bonding social capital refers to strong tires and relationship within a network, or community or group who are similar in some ways (Putnam 2000; Hawkins and Maurer 2010). Bridging social capital refers to weaker tires and relationships between different or heterogeneous groups (e.g. differing in socio-economic status, race/ethnicity, and education) (Woolcock and Narayan 2000; Adger 2003; Hawkins and Maurer 2010). Linking social capital refers to the relationship between individual with institution or other individuals based on social power and power dynamics of institutions (Woolcock and Narayan 2000; Hawkins and Maurer 2010). Hawkins and Maurer (2010) have analyzed the role of social networks in terms of bonding, bridging, and linking social capital, during the aftermath of hurricane Katrina, for evacuation, rebuilding, and redevelopment process. They found that bridging, bonding, and linking social capital were equally important to mobilize the resources in diverse socio-economic populations, to boost mental well-being, and facilitate the reconstruction process. Tobin et al. (2016) have examined the role of personal networks in the post disaster recovery process in two study area- Mexico, and Ecuador. The article specifically analyzed the association between gendered based network and mental well-being in a post disaster setting. They found that the gendered based mental well-being followed by a hazard event depends upon several factors such as composition of personal networks, emotional and social support, and structure of networks. They highlighted challenges associated with post disaster resettlement process, to rebuild the personal networks, and post disaster mental health. Faas et al (2014) examined the role and dynamics of social networks in the post disaster resettlement settings. They stressed the importance of analyzing both personal and whole networks of communities to understand the dynamics of social relationships. They recommended that the analysis of social network specially- density,

bridging, and subgroups cohesion can help planner and policy makers in the resettlement process. Table 1.2 shows some example of social capital in the hazards and climate change literature.

**Table 1.2: Examples of Social Capital in Hazards studies (Literature Review)**

| Social capital (Indicators) | Applications | References | Journals |
|---|---|---|---|
| Social network of religious organization | for recovery, evacuation, and relocation (church-based Katrina recovery) in New Orleans Vietnamese American Community | Airriess et al (2007) | Geoforum |
| Community participation (local knowledge and capabilities of local people) | for community-based disaster preparedness with integrated approach for sustainable development after Philippines earthquake | Allen (2006) | Disasters |
| Trust, norm, networks | community disaster resilience after Indian Asian Tsunami | Mayunga (2007) | Ecological Economics |
| Role of community participation/civil society | disaster preparedness, response and recovery, and role of community indecision-making process | Patterson, Weil, and Patel (2010) | popul res policy rev |
| Aspects of social structure (social relations and institutions) | disaster response and community resilience | Dynes (2005) | Delaware Research Center |
| Institutional trust, social norms of reciprocity | to promote participatory planning and adaptive management for climate change | Menzel, Buchecker, Schulz (2013) | Journal of Environmental Management |
| Social network of strong and weak ties | improve community resilience to risk and hazards two cities in US and Canada | Murphy (2007) | Natural Hazards |
| Community level collective narratives | to facilitate post-disaster recovery process and development in Parish community, New Orleans | Chamlee-Wright and Storr (2011) | The Sociological Review |
| Social linkages (co-operations) | to facilitate local empowerment and sustainable environment management | Pelling (1998) | Journal of International Development |

| | | | |
|---|---|---|---|
| Trust, reciprocity, and social network, bonding and networking social capital | coping mechanism with vulnerability and risk (adaptation strategies after hazard event) | Adger (2003) | Economic Geography |
| Number of non-profit organizations | facilitate post-disaster recovery after Kobe earthquake in Japan | Aldrich (2010) | Natural Hazards |
| Citizen participation, sense of community, and place attachment | as an indicator of disaster resilience framework model to measure resilience of places | Cutter et al. (2006) | Journal of Homeland Security and Emergency Management |
| Social connections, social network | to enhance community and social resilience and reduced impact of social vulnerability from hazard events | Morrow (2008) | CARRI Research Report 4 |
| Social/institutional trust, social norms, social networks | influence of social capital on risk perception for climate change | Jones et al. (2011) | The Social Science Journal |
| Bonding, bridging, and linking social capital (role of civic engagement) | facilitate disaster recovery process after Gujarat earthquake, and Mano earthquake | Nakagawa and Shaw (2004) | International Journal of Mass Emergencies and Disasters |
| Bonding, bridging, and linking social capital | to enhance social resilience and adaptation to climate change in lakeshore villages in Uganda | Goulden et al. (2013) | Annals of the Association of American Geographers |
| Social networks (role of social contacts) | positive impact to reduce vulnerability and risk from the impacts of heat waves (climate change) in the two UK cities | Wolf et al. (2009) | Global Environmental Change |
| Social trust | severity of natural disaster can have both positive and negative impact on social capital (based on two different hazards event in Europe) | Albrecht (2018) | Disasters |
| Civic engagement, trust, contact with neighbors | facilitate post-disaster recovery and resilience in a rural community Indiana | Sadri et al. (2018) | Natural Hazards |
| Social learning, coordination | importance of social learning in post-disaster recovery scenario after hurricane Sandy | Storr and Grube (2016) | The Review of Austrian Economics |

Despite being recognized as an important component of disaster recovery process, social capital is not explicitly incorporated into disaster recovery and hazards planning (Berke1993; Tobin 1999; Cutter et al., 2006; Frazier et al., 2013). Additionally, social capital has been mostly analyzed for the post disaster recovery both at the individual and community level; however, a comprehensive understanding of social structure of institutions, and network of stakeholders who are involved in the recovery process has not been thoroughly analyzed. Analyzing social capital of institutions and stakeholders who are involved in the disaster recovery and decision-making process can help to understand what opportunities and constraints there are to enhance social capital and better prepare for the disaster recovery from hazard events. Based on the conceptual framework of social capital, this research examines the role of social capital to facilitate the disaster recovery process. More specifically, this research has three important components for the comprehensive assessment of social capital for the study site: evaluate role of social capital into hazards plan, analyze dynamics of structural social capital of institutions, and model social network of recovery stakeholders. To evaluate the presence of social capital in hazards plans a content analysis method is performed. To examine the dynamics of structural social capital of institutions, this research incorporates mixed methods including quantitative multivariate techniques and qualitative survey analysis. For social network modeling, this research incorporates and expands on methodological concepts and tools, such as centrality analysis, blockmodeling, and nonmetric multidimensional scaling utilized by Wasserman and Faust (1994), Doreian et al. 2005; Knoke and Yang (2008), and Borgatti, Everett and Johnson (2013). This research uses the UCINET tool developed by Borgatti et al (2012) to apply the methodological concepts of centrality analysis, block modeling, and multidimensional scaling. These methods help to understand

the position and structure of stakeholders involved in the disaster recovery process. This dissertation has been written to stand as three manuscripts so there will be some repetition to ensure each manuscript is a stand-alone manuscript. Chapter 2, 3, and 4 has been written as an individual manuscript.

## 1.4 Goals and research questions

This study follows a sequential transformative strategy of inquiry research model that includes the two distinct data collection phases (qualitative and quantitative), one following the other (Creswell 2003). This study integrates both qualitative and quantitative research approaches to develop a comprehensive social capital framework. The overall goal of the research is to evaluate the role of social capital to facilitate the disaster recovery process. In order to achieve this goal, a sub-goal is created to build a theoretical framework of social capital (Figure 1.2) to evaluate interdependence of agencies and social structure for recovery and planning. The units of analysis for this study are institutions, agencies, and stakeholders. To address the following research questions, this study develops a theoretical and methodological tool for social capital analysis and applies this tool to the research study area. The study further conducts surveys and semi-structure interviews with disaster recovery stakeholders to understand the inclusion of social capital in disaster recovery and planning, and the position of stakeholders into the decision-making process. Additionally, the study assesses the dynamics of structural social capital of institutions to understand opportunities and constraints for incorporating social capital into disaster recovery. The research questions are as follows:

1) What is the role of social capital in the hazards planning and disaster recovery process?

2) Based on structuration theory, is it possible to develop a comprehensive social capital framework to better understand the interdependence of social structure and human agencies for the enhancement of community resilience?

3) How can the inclusion of social networks into disaster response and recovery strategies facilitate disaster response and recovery?

4) How can the inclusion of multiple stakeholders from both governmental and non-governmental institutions into the decision-making process lead to a more efficient recovery process?

5) What are opportunities and constraints for incorporating structural social capital into short and long-term disaster recovery process?
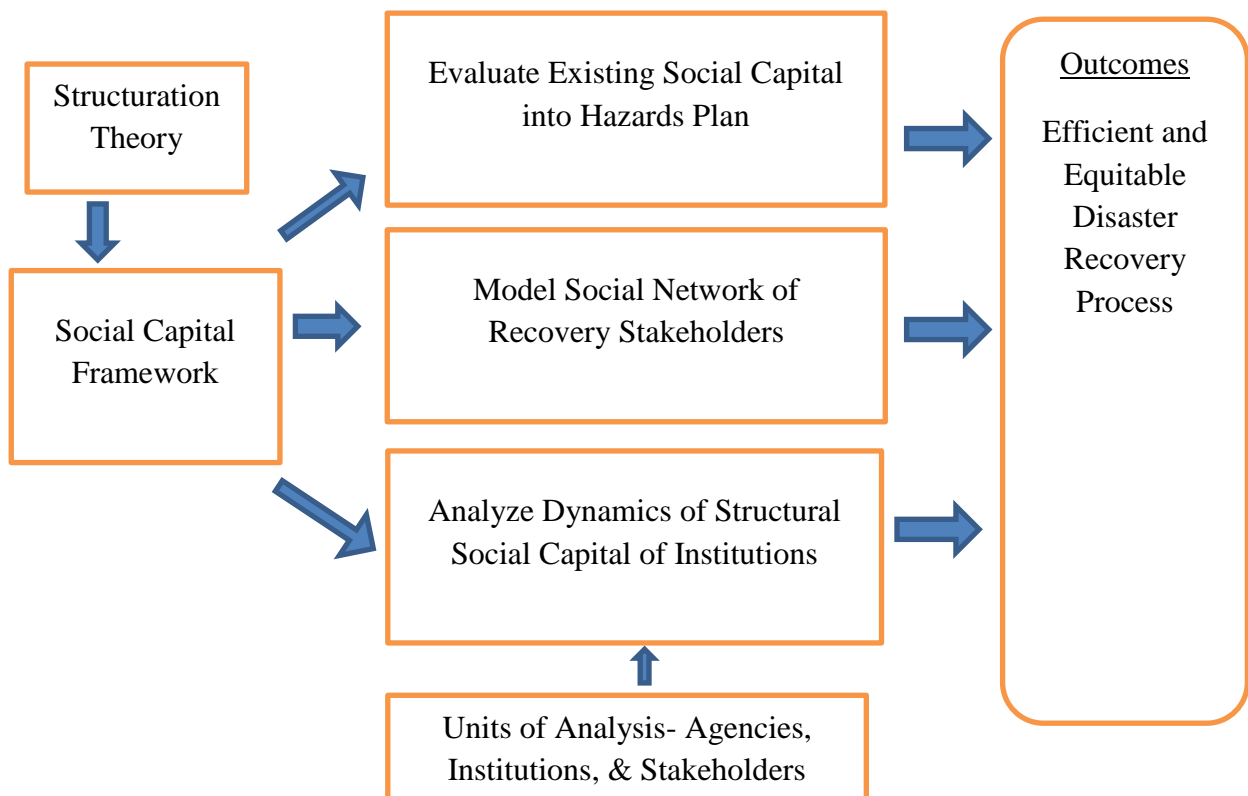
Figure 1.2: A Framework of Social Capital Assessment based on Research Questions

**1.5 Study Area**

My proposed study area is Manatee County in Florida. Florida has a long history of hurricanes, tropical storms, flooding and other disasters leading to huge societal losses. The state of Florida has 2000 miles of coastline and, a continually growing population, with 80% living in coastal areas. Florida has had approximately 287 tropical storms directly or indirectly impacting its shorelines over the last 100 years with approximately 10 affecting the Tampa Bay area, which is also a part of Manatee County (Multi-hazard identification, FEMA, 1997). Thus, there is a need for hazard mitigation planning in the state due to its historical and current hazard exposure. Florida's vulnerability to natural disaster arises from the fact that approximately 78% of the population reside in Florida's 35 coastal counties including Manatee County (Florida Division of Emergency Management 2010; Florida PDRP 2010). Because of Florida's exposure to natural hazards, the state and counties in the state typically have sophisticated hazard mitigation plans including LMS (Local Mitigation Strategies) and Post Disaster Redevelopment Plans (PDRP), making Manatee county an excellent study area for the evaluation of high-quality hazard mitigation plans. LMS plans help communities to identify hazards mitigation strategies and manage pre-and post-disaster recovery to minimize loss of life and property (LMS 2014). Further, Manatee County has a mandated Comprehensive plan to monitor community development. A PDRP identifies policies, strategies, roles and responsibilities for implementation, in order to guide the decision-making process that affects long-term recovery and redevelopment of the community after a disaster (PDRP 2008; Florida DPRP 2010). The Comprehensive Plan provides long range policy guidance for the social, economic, and physical growth of the County. The state also has a

"sunshine" law that requires sharing of their GIS data with the public including for research purposes.
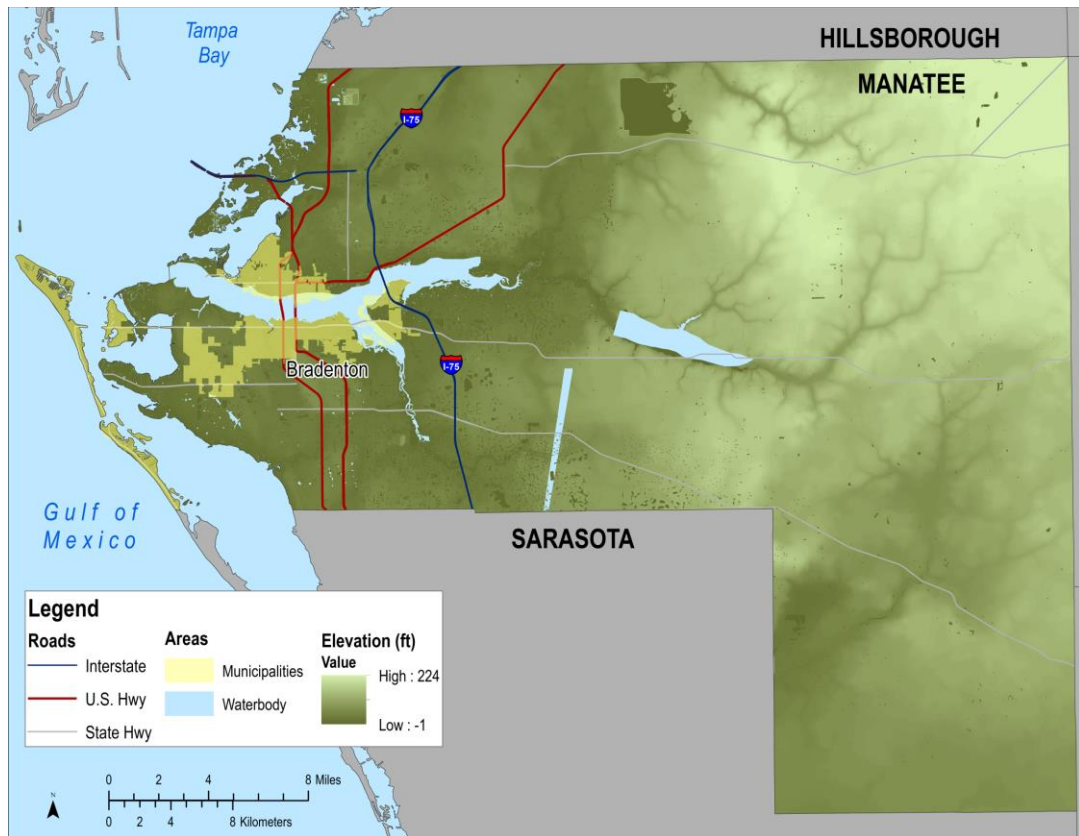


**Figure 1.3: Study Area, Manatee County**

Manatee County is located on the west Coast of Florida (Figure 1.3) and is bounded on the north by Hillsborough County, the south by Sarasota County, the east by Hardee and Desoto Counites, and the west by Tampa Bay, Sarasota Bay, and the Gulf of Mexico. It is a part of the Bradenton-Sarasota-Venice Metropolitan Statistical Area. The county has a total area of 892 square miles; of which 741 square miles is land and 151 square miles is water (LMS 2014) The County is broadly divided into three physiographic regions: coastal lowlands, Polk upland, and Desoto Plain. There are six incorporated jurisdictions in Manatee County: Anna Maria, Bradenton, Bradenton Beach, Holmes Beach, Longboat Key, and Palmetto. The county also has several unincorporated areas: Ellenton, Myakka City, Parish,

and Lakewood Ranch (LMS 2014). The County has experienced significant population growth within the last decade, having undergone an approximately 20% population increase from 2000 to 2010 (US Census, 2010). The county has a high number of special needs populations, such as seasonal migrants and, elderly populations (PDRP 2008; US Census 2010)). Due to the subtropical location and long coastline, the County is vulnerable to a variety of natural hazards including hurricanes, floods, tornado, thunderstorms, beach erosion, and sea level rising. In the last century, the county has experienced at least 5 to 6 hurricanes (Hurricane Elena (1985), Hurricane Ivan (2004), Hurricane Charley (2004) and many tropical storms (LMS, 2014) that have caused flooding and damage to the county population and infrastructure. The interior portions of county have also experienced many tornadoes. With the ever-growing population and high number of mobile homes located in hazards areas, the potential damages associated with tornadoes is also growing in the county (PDRP 2008; LMS 2014). Manatee County has been impacted by 15 severe hazards events and received Presidential Disaster Declarations (PDRP Guide) on a number of occasions. Table 1.3 shows the list of major Presidential Disaster Declarations for Manatee County.

**Table 1.3: Disaster Declarations List**

| Presidential Disaster Declarations for Manatee County | |
|---|---|
| **Year** | **Disaster** |
| 1968 | Hurricane Gladys |
| 1972 | Tropical Storm Agnes |
| 1982 | Severe storms and flooding |
| 1985 | Hurricane Elena |
| 1992 | Severe storms and flooding |
| 1993 | Tornadoes, flooding |
| 1996 | Tropical Storm Josephine |
| 1998 | Tropical Storm Gabrielle |
| 2001 | Tropical Storm Gabrielle |
| 2003 | Severe storms and flooding |
| 2004 | Hurricane Charley and Tropical Storm Bonnie |
| 2004 | Hurricane Frances |
| 2004 | Hurricane Ivan |
| 2004 | Hurricane Jeanne |

Source: FEMA 2008

Due to high exposure of natural hazards, it is particularly important that the county have a better understanding of the strength and weakness of social institutions and stakeholders who are involved in the disaster recovery planning and process. I reached out to Manatee county emergency manager and he agreed to provide the required help and support necessary for the completion of the research. While there has not been a major direct impact from a hurricane events in the county recently, county officials recognize that the county could be impacted by future storms and hazard events. The officials showed interest in this research to understand how social capital assessment can help to facilitate the disaster recovery process in diverse socio-economic population.

**1.6 Structure of the Study**

The dissertation is divided into five chapters: the first chapter titled "Theoretical framework of social capital for short- and long-term post-disaster recovery" provides an overview of structuration theory and seminal works of some social scholars to understand the

conceptual basis of social capital. This chapter adds a brief literature review to demonstrates the role of social capital into disaster recovery. This chapter also includes- research goals and study area. The second chapter titled "Evaluating types of social capital into hazards plans" seeks to evaluate and analyze Local Mitigation Strategies, Comprehensive Plan and Post Disaster Recovery Plan (PDRP) in Manatee County to determine presence or absence of social capital into planning and recovery. This chapter utilizes a content analysis method to evaluate the role of social capital into hazards plan. Further, this chapter also includes and analyzes the semi-structured interview conducted with stakeholders from the study area. The third chapter titled "Modeling social networks of disaster recovery stakeholders to enhance social capital and thus lower social vulnerability" applies the theoretical and methodological tools of social networks of stakeholders to understand existing structure of agencies to access and mobilization of resources in recovery and planning. The fourth chapter titled "Understanding opportunities and constraints for incorporating social capital into short and long-term disaster recovery" assess the dynamics of structural social capital of institutions by incorporating mixed methods to understand the opportunities and constraints of social institutions and social networks for disaster recovery and planning. The final concluding chapter provides the summary, limitations, and significance of the research as well as suggestions for future research.

# Chapter 2: Evaluating types of social capital into hazard plans: A case study of Manatee County, Florida

## 2.1 Introduction

More comprehensive hazards and disaster planning has the potential to lessen the impacts of hazards on loss of life and property. FEMA (Federal Emergency Management Agency) requires states, counties, and local governments to develop and adopt HMPs (Hazard Mitigation Plans) to qualify for specific types of disaster assistance and funding. HMPs objectives are to have well-integrated pre-disaster mitigation strategies as well as a post-disaster recovery plan (Tobin 1999; FEMA 2014). Typically, a well-integrated hazards plan needs to include both structural and non-structural measures to reduce the impact of hazard events. However, the development of hazard plans and policies have been more directed towards structural measures, and less attention is given to the non-structural measures such as role of social capital to deal with hazard events (Tobin 1999; Burby et al. 2000; Dynes 2005; Morrow 2008; Berke et al. 2012; Frazier et al. 2013). A well-integrated hazard plan, which includes both structural and non-structural measures, can help to facilitate the response and the disaster recovery process (Godschalk et al. 1999; FEMA 2008).

Studies in the hazard and climate change literature (Adger 2003; Nakagawa and Shaw 2004; Cutter and Emrich 2006; Airriess et al. 2007; Colten et al.2008; Aldrich 2011) have found that different facets of social capital such as patterns of social interaction, the social network of organizations, and social structure of a community contribute to a positive differential rate of recovery. Social capital is important for the disaster recovery process; however, there is often a limited incorporation of social capital into hazard mitigation and disaster recovery plans (Tobin 1999; Frazier et al. 2013) Incorporation of social capital into

hazards plans can be an effective way to increase community participation, stronger social networks, and overall development within a community and as such increase overall community resilience.

## 2.2 Types of social capital incorporated into hazards plans and recovery process

Social capital has been defined as resources embedded in social networks and social structures, which can be mobilized by human agencies and institutions (Mohan and Mohan 2002; Lin 2001). The significance of social capital for disaster management including mitigation, preparedness, response, and recovery has been analyzed by different hazard scholars (Pelling 1998; Adger 2003; Smith and Boruff 2011). Incorporation of social capital into response and recovery processes has been considered an important element to reduce social vulnerability and create resilient communities (Morrow 1999; Tobin 1999; Nakagawa and Shaw 2004; Dynes 2005; Cutter and Emrich 2006; Cutter et al. 2006; Murphy 2007; Colten et al. 2008). Strong social capital in terms of social relations attributes such as trustworthiness, social ties, and reciprocal activities facilitates collective action and helps better access and mobilization of community resources during response and recovery (Berke et al. 1993; Reddy 2000; Adger 2003; Dynes 2005; Murphy 2007; Smith and Boruff 2011). Strong social networks in terms of horizontal (bridging and bonding) and vertical (linking) relationships have been found positively associated with efficient response and recovery processes (Airriess et al 2007; Murphy 2007; Aldrich 2011). Strong social networks and connections can foster a high level of trust, number of social ties, and reciprocal activities which can help communities to act together and can involve local people in the decision-making process (Murphy 2007; Smith and Boruff 2011; Aldrich 2011). Further, types of social networks such as individual, whole, dense, sparse network can also be instrumental to

facilitate the differential rate of reciprocity, exchange of resources, and resettlement settings

after a hazard event (Faas et al. 2015; Jones et al. 2015; Tobin et al. 2016)

A well-coordinated social network and community participation also help to

facilitate the shared narratives and dissemination of knowledge of diverse populations and

stakeholders. Studies (Chamlee-wright and Storr 2011; Marrero-Lopez and Tschakert 2011;

Storr and Grubel 2017) found that community based shared knowledge and involvement of

diverse participants skills and experiences can help to develop better hazard polices and

facilitate response and recovery. Further, the role of social organizations, especially non-

governmental organizations, has been found crucial for the immediate relief, evacuation

process, mobilization of resources, and redevelopment (Adger 2003; Colten et al 2008).

Aldrich (2011) outlined the importance of social capital to facilitate post-disaster recovery

by analyzing the 1995 Kobe earthquake in Japan by comparing two similar neighborhoods.

A community with strong social capital (non-governmental organizations) was found more

successful in rebuilding and recovery after the catastrophe (Aldrich 2011). As such, social

capital has been identified as one of the most important explanations for differential

preparedness, response, and recovery to Hurricane Katrina in New Orleans and along the

Mississippi Gulf Coast (Cutter et al., 2006; Cutter and Emrich 2006; Colten et al. 2008), and

other hazard events such as the Kobe earthquake (Aldrich 2011) and Indian Ocean tsunami

(Munasinghe. 2007).

Despite the literature suggesting that social capital is important for disaster recovery,

it is not usually a central element in hazard plans. Additionally, most of the hazard studies

have analyzed the role of social capital in the post disaster recovery process; however,

understanding and incorporation of social capital in the planning and preparedness phase can

help to better prepare for the hazard events.  In order to create efficient disaster recovery process, it is imperative to have effective mitigation planning and preparedness processes as well as efficient pre and post disaster recovery plans (Drabek 1985; Mileti 1999; Tobin 1999; NRC 2006; Quarantille and Dynes 2006; Smith and Boruff 2011; Frazier et al. 2013, Aldrich et al. 2018). Also, effective hazard mitigation planning can serve as a mediator for both the immediate response period and the post-disaster recovery process. Incorporation of social capital into hazards plans can serve to facilitate the disaster recovery process (Tobin 1999; Burby et al. 2000; Nakagawa and Shaw 2004; Dynes 2006; Smith and Boruff 2011; Frazier et al. 2013).

The quality of plans dealing with critical planning issues including sustainable development, land use planning, housing, climate change, hazards mitigation, and natural hazards has been evaluated by different scholars to determine how policymakers understand and identify hazards problems, coordinate between various agencies and organizations, understand role of social heterogeneity, articulate goals, and incorporate diverse populations (Baer 1997; Godschalk et al. 1999; Berke et al. 1999; Berke et al. 2012; Smith et al. 2014). Godschalk et al. (1999) and Berke et. al. (2012) have evaluated the quality of various state plans and found out that strength and weakness of state plans depends upon various factors such as effective communications of agencies, strong networks of organizations, financial resources, collaborative efforts, and socio-economic and political set up. Burby (2006) examined the devastation caused by Hurricane Katrina in New Orleans and found that lack of coordination between federal and local agencies and building codes for urban development and policy implementations were associated with massive destruction and damage after hurricane Katrina. The article highlighted that with the development of "Lake

Pontchartrain Project" the federal policies have expanded the development in hazardous areas in New Orleans. The building codes and policies implementation had caused more development in low lying, flood-prone areas in New-Orleans which contributed to damages during hurricane Katrina. The article suggested that DMA (Disaster Mitigation Act) 2000 should be amended to integrate local comprehensive plans into the hazards mitigation plans and that can help involvement of local knowledge into the decision-making process.

Studies have found that coordination among various agencies, the inclusion of local knowledge, and involvement of local community in hazards plan and polices are missing elements in the planning document (Smith et al. 2012; Frazier et al 2013). In spite of the efforts of many scholars (Berke and Campanella 2006; Smith et al. 2012; Berke et al. 2014) to understand and enhance the dynamic nature of the planning process, there is still a lack of comprehensive understanding of ways to incorporate social capital to advance community resilience (Frazier et. al. 2013a). More efforts are needed to evaluate current planning processes and to find and fill existing gaps.

This research evaluates the presence or absence of social capital in the most relevant hazard plans of Manatee County, Florida including Local Mitigation Strategies, Comprehensive Plans, and Post Disaster Redevelopment Plan for the holistic assessment of pre-disaster and post-disaster recovery plan for the community resilience and development. Only those hazard plans that include goals and objectives of mitigation and recovery strategies, identification of hazards issues, and polices to reduce impact of damages and loss from hazard events were selected for the analysis. The Local Mitigation Strategies, Post Disaster Development Plan, and Comprehensive Plan are interconnected to each other in

terms of defining and analyzing various plans and polices related to community resilience and development.

**2.3 Manatee County hazards plan**

Due to exposure of natural hazards and experience gained through previous disasters, Manatee County has primarily three hazards plan including Local Mitigation Strategies (LMS), Post Disaster Redevelopment Plan (PDRP), and Comprehensive Plan. Under Florida Law, Manatee County has a mandated Comprehensive Plan to monitor overall community development. The Comprehensive Plan is considered the highest-level planning document in the state of Florida. The Comprehensive Plan of Manatee County was developed as the requirement of Chapter 163, Florida Statutes (F.S.), the "Local Government Comprehensive Planning and Land Development Regulation Act." The Comprehensive Plan provides long range policy guidance for the social, economic, and physical growth of the County. The major goals of the Comprehensive plan include: to develop community resources and physical settings, protect the public health, ensure economic opportunities, provide political cooperation and technical coordination, and to bring over all community development. The coastal element of Comprehensive plan specifically deals with the goals and objectives of hazards mitigation strategies and post disaster planning.

The county's Local Mitigation Strategy (LMS) was adopted in 1999 as a part of the Hazard Mitigation Grant Program (HMGP), with updates in 2004, 2009, and 2014. LMS help communities to prepare for hazards mitigation strategies and manage pre-and post-disaster recovery to minimize loss of life and property (LMS 2014). The LMS is a multi-jurisdictional plan to reduce the impacted hazards within a county (FEMA, LMS 2014). LMS deals with all types of natural hazards that affect the community, including natural,

technological, and societal hazards (LMS 2014). LMS have been designed to focus on

proactive approaches, rather than reactive measures, to deal with disasters. The LMS

includes an initiatives list that is regularly updated with identified and prioritized projects to

improve the overall capabilities and reduce the vulnerability of the County (LMS 2014). The

updates of the Manatee County LMS are the result of cooperation between the County and

its six municipalities (Anna Maria, Bradenton, Bradenton Beach, Holmes Beach, Longboat

Key, Palmetto), fire districts, and sheriff's office (LMS 2014).

In 2006, Florida mandated local recovery plans for all coastal counties and

municipalities. A PDRP identifies policies, strategies, and roles and responsibilities for

implementation to guide the decision-making process that affects long-term recovery and

redevelopment of the community after a disaster (PDRP 2008; Florida DPRP 2010).

Recovery can be defined as the opportunity to incorporate policies to improve the

redevelopment process following a natural or man-made disaster (Berke et al.1993; Reddy

2000; Florida DPRP 2010). The PDRP in the state of Florida was sponsored by Florida

Division of Emergency Management, the Florida Division of community planning, and the

Florida Department of Environmental Protection, with support and funding by the National

Oceanic and Atmospheric Administration and the Federal Emergency Management Agency

(PDRP 2010). The PDRP needs to incorporate: housing repair and reconstruction, economic

development, infrastructure restoration and mitigation, long-term health and social services

support, environmental restoration, and short-term recovery actions that affect long-term

recovery issues (DPRP 2010). The PDRP incorporates opportunities for hazard mitigation

and community improvement consistent with the goals of the local comprehensive plan

along with public participation (DPRP 2008). Florida has designated six pilot communities

that have completed PDRPs to assist in the creation of a report that will help the rest of the State's jurisdictions draft plans. The pilot communities are Panama City, Hillsborough County (Tampa Bay), Manatee County, Nassau County, Polk County, and Sarasota County (Florida PDRP 2010). In 2008, Manatee County was selected as a pilot community for the development of a PDRP.

## 2.4 Data and methods

This chapter addresses the first research question and evaluates the role of social capital in the hazards plans and recovery process. The primary data source was semi structured interviews with key stakeholders, and the secondary data source was plan documents review. Hazards planning documents (LMS, PDRP, and the county's Comprehensive Plan) were collected from Manatee County official websites. The Manatee County Emergency Management office was then contacted via email, and a personal visit with Emergency Management Chief was conducted to provide research details including confirmation that all the planning documents listed on the website were the most updated ones.

Additionally, semi-structured interviews were conducted with key stakeholders to understand the reliance on and role of social capital for the disaster recovery and planning process. The County website was searched to recruit the key agency personnel. Interviews were scheduled through e-mail and phone correspondence. Interviews with study participants took place in April 2014, and a follow-up interview was conducted in September 2017. The interview followed a semi-structured format with open-ended questions. Interviews were scheduled and conducted with the Emergency Management Chief, Officers of the Emergency Management Office, Department Director Neighborhood

Services, Department Director Community Services, AICP County Planning Official, and Director of the Salvation Army. The interviews followed a semi-structured format with open-ended questions (see Appendix A for a list of interview questions and details).

The interviews were recorded and later transcribed and analyzed. A total of five semi structured interview questions were developed to address the main research questions These questions are related to understanding how the concept of social capital is understood and utilized in the planning and recovery process. These questions are:

1. What are the biggest resource constraints you face when a disaster event occurs?

2. What is the existing role of or reliance on social capital for non-structural mitigation strategies in the hazards plan?

3. Do you think the existing reliance on social capital is sufficient to help respond to and recover from major disaster events?

4. What are the constraints to incorporating social capital into non-structural strategies and how can these constraints be changed?

5. What is the existing role of social services such as non-governmental organizations and other community-based organizations in planning process?

**2.4.1 Social capital indicators**

The selection of social capital indicators is based upon the theoretical framework of social capital (discussed in chapter 1). Based upon the application of structuration theory (Lin 2001; Mohan and Moan 2002), a total of 5 indicators of social capital were developed to evaluate the planning documents. Each indicator is assigned 3-4 specific questions to get in-depth analysis and evaluation of planning documents. These indicators are: Community

Participation, Social Organizations, Social Relation, Social Network, and Shared Narratives

and Knowledge. Table 2.2 shows the indicators of social capital selected for this research.

**Table 2.1: Indicators of Social Capital**

| **Community participation** |
| --- |
| Identification of techniques to involve citizen participations/civic engagement in the planning process? |
| Identification of local groups/local trusted leaders which are involved into planning and community services? |
| Identification and utilization of community resources during response and recovery process. |
| Identify role of communities to build social relations (social trust, institutional/civic trust, social ties), develop sense of belonging in the community and its impact on community participation during emergency? |
| **Social Organization** |
| Incorporate formalized plan to define role of social organization in emergency response and planning? Does the plan identify capabilities of social organizations? Does the plan mention mandatory training for social organizations to deal with emergency response and recovery process? |
| Does the plan include a goal to increase the coordination between non-governmental and governmental institutions to achieve a common good? |
| **Social relations** |
| Does the plan mention the importance of social relations (reciprocity, trust) for the exchange of information and resources during a hazard event? Does the plan identify ways to overcome social inequality (linguistic and cultural barrier) for access and mobilization of resources and special polices for socially isolated populations? |
| Does the plan identify role of social heterogeneity (interaction of different racial/social groups) in preparedness, planning and recovery? |
| **Social network** |
| Does the plan mention importance of social network for dissemination of knowledge and information about hazard preparedness and planning, and for the evacuation purpose? Does the plan identify importance of vertical and horizontal relationships between community and agencies to facilitate communications and for the policies and planning? |
| Indication of coordination among governmental and non-governmental agencies for exchange of resources and information especially during response and recovery? Identification of social network between local people and organizations and how it has changed over time? |

| **Shared narratives and knowledge** |
| --- |
| Identify ways to incorporate common shared experiences and visions of community and agency in hazards and disaster plans? |
| Does the plan identify ways to foster collaborative learning as a disaster risk reduction technique for the community? |
| Does the plan mention the way to incorporate existing knowledge and experiences of multiple stakeholders to use as a reference for future hazard plans? |

## 2.4.2 Content analysis

Content analysis has been considered as one of the most prevalent research techniques in social science studies. This research utilizes content analysis research method to evaluate the presence or absence of social capital indicators (see Table 2.2) in the current PDRP, LMS, and Comprehensive Plan for Manatee County. Content analysis of planning documents helped to identify social capital indicators by coding and analyzing social capital indicators, and examine the role of social capital in all the three planning documents. . Content analysis for each of the planning documents was coded and analyzed using the NVivo Pro 11 software, which is a Computer Assisted Qualitative Data Analysis Software (CAQDAS). Content analysis is a qualitative research method that systematically analyzes documents, texts, and images (Krippendorff 2004; Wong 2008; Lyles and Stevens 2014). There are mainly two types of content analysis. Process-coding by researchers uses coders to analyze texts and documents. The second type is computer aided text analysis for automated content analysis of documents. However, human coders are a prerequisite for the computer-aided analysis of the validation and reliability of data and systematic origination of contents (Krippendroff 2004). The computer aided content analysis process is more efficient and less labor intensive even though the organization, coding, analysis, and interpretation of the data have to carried out by the researchers (Krippendroff 2004; Wong 2008).

The development of computer aided software such as NVivo and ATLAS.ti has revolutionized the qualitative content analysis methodology and procedures. Word processing software, digital data formats, and other computational techniques have been instrumental in the development of computer-aided text analysis (Krippendroff 2004; Wong 2008). Krippendroff (2004) has developed a framework to explain the conceptual components of content analysis. The framework is broadly divided into three steps : data collection, , research questions, and content analysis. Texts or any form of data are a prerequisite to conducting any empirical research. Any forms of data such as surveys, focus groups, documents, and articles are meant to be interpreted and understood by other people, not just research coders or scholars. Referring to the terms in Figure 2.1, the research question is used to develop coding to create nodes for further analysis of texts. The final output of content analysis helps to interpret meaningful inferences of the results. Analytical construct is useful when the input texts are context or theme-specific.  The unit of measurement of design content analysis ranges from the smallest unit as word, theme, character, and item (Krippendorff 2004).

**Data Collection**
- Documents
- Articles
- Surveys

**Research Question**
- Hypotheses testing
- Coding
- Inferences

**Content Analysis**
- Valid inferences
- Analytical construct
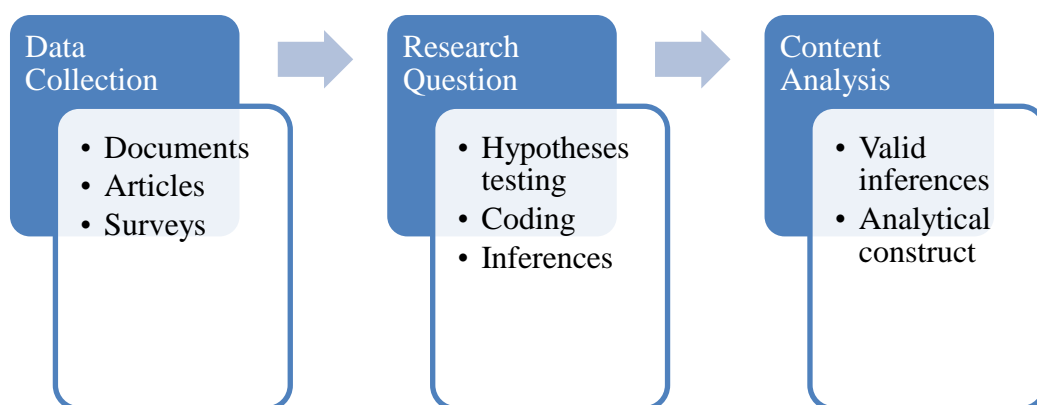
**Figure 2.1: Content Analysis Framework (from Krippendorff, 2004)**

Content analysis is used by various studies in the planning literature (Burby and Dalton 1994; Berke et al. 1999; Godschalk et al. 1999; Berke and Godschalk 2009; Berke et al. 2012) as a methodology to measure the quality of various types of plans dealing with critical planning issues including sustainable development, land use planning, housing, climate change, and natural hazards. Previous studies have evaluated and coded the quality of planning documents based on FEMA or state requirements and existing coding protocols.

The steps for content analysis utilized in this research are outlined in Figure 2.1 First, a project was created in NVivo to upload PDRP, LMS, and the Comprehensive Plan in pdf format. After that, theme-based nodes were created for all the social capital indicators, and further node hierarchies were created for each node. The creation of node hierarchies helps to incorporate detailed information for each node and can serve as parent-child node relationships. Creation of nodes helps to perform query and coding of all the documents. Further, all the parent nodes and hierarchical child nodes were aggregated to get the overall perspective for data coding.

For coding of documents, a text search query and word frequency query were performed. Word frequency analysis was conducted on all three documents to look for the most commonly occurring words and themes. The word frequency analysis output generates word cloud map of all three planning documents, it gives the number of words counts for most frequent words and weighted percentage of most frequent words. In the display words section, number of most frequent words can be selected by the researchers. Weighted percentage shows the frequency of the word in comparison to total words counted. Weighted percentage depends upon how the grouping of word slider is selected by the researchers. It assigned part of the word frequency to each group to make sure overall value does not

exceed 100%. A detailed text search query was also performed and coded for each node based upon the social capital indicators in Table 2.2. For in-depth analysis, greater comparison, and visualization of data, both NVivo and Microsoft Excel were used.

The NVivo query output provides the numeric value of total references coded for each node in all the planning document. Nodes are indicators of social capital. Text search query was performed for all the three documents separately. Further, to visualize the input from the NVivo numeric data of references coded for each planning documents, hierarchy chart was created in Microsoft Excel. First, NVivo data of reference code of all the three planning documents is converted into percentages to create three hierarchy diagrams. Hierarchy diagram of nodes illustrates comparison of coding references for each social capital indicator for all the three-planning document. Hierarchy diagram is one of the ways to visually represent the percentages value of all the nodes by displaying percentage values of all nodes in a rectangle diagram. A node with high coding references shows as a large rectangle whereas a node with low coding reference shows as a small rectangle.

Analysis/Results

Coding

Project Creation

Query

Node Creation
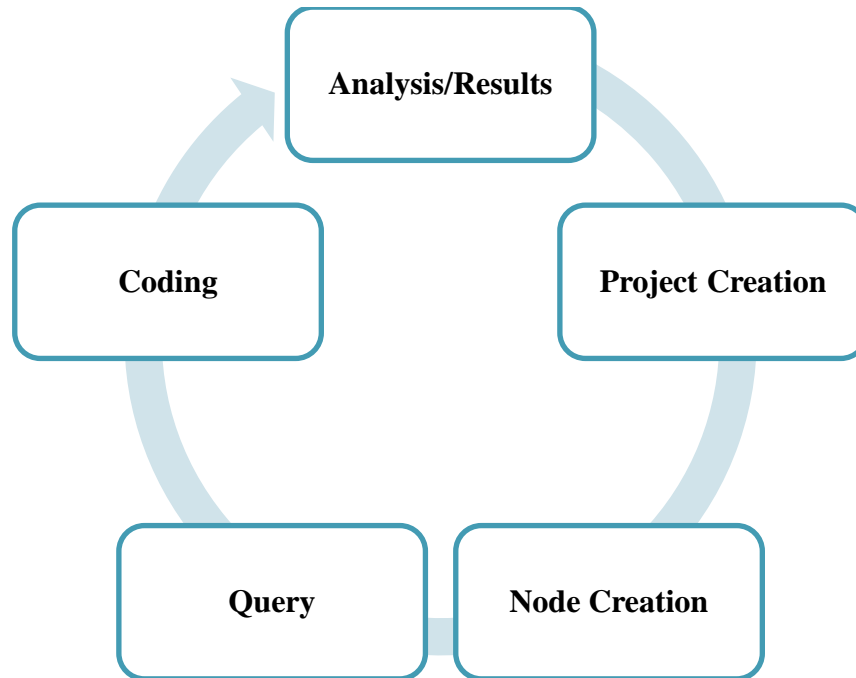
**Figure 2.2: NVivo Content Analysis Steps**

## 2.5 Results

### 2.5.1 Word frequency query

Initially, a word frequency query was conducted to look for the most commonly

occurring themes, concepts, and keywords in all the three planning documents. Word

frequency query was conducted for 1000 most frequently used words with a minimum

length of five letters and a grouping of synonymous words. The output of word frequency

analysis of LMS, PDRP, and the Comprehensive Plan included the most count words length,

and weighted percentages, and was visualized through word cloud maps. Figures 2.3, 2.4,

and 2.5 represent the word cloud diagrams of the LMS, PDRP, and Comprehensive Plan.

The most count words in Comprehensive plan are policy (1495 count, 1.11 weighted

percentage), county (1442 count, 1.07 weighted percentage), manatee (1285 count, 0.96

weighted percentage), development (1159 count, 0.86 weighted percentage).  The most

count words in PDRP are county (834 count, 3.25 weighted percentage), manatee (625

count, 2.44 weighted percentage), plan (468 count, 1.82 weighted percentage), disaster (454 count, 1.77 weighted percentage), development (454 count, 1.77 weighted percentage). The most count words in LMS are county (1298 count, 1.50 weighted percentage), manatee (1159 count, 0.81 weighted percentage), public (703 count, 0.63 weighted percentage), plan (543 count, 0.63 weighted percentage), development (506 count, 0.59 weighted percentage). The word frequency query of all the three planning documents show that the most frequently occurring words in all planning documents are quite similar in nature.



**Figure 2.3: Word cloud Comprehensive Plan**

**Figure 2.4: Word Cloud PDRP Plan**



**Figure 2.5: Word Cloud LMS Plan**

**2.5.2 Coding and text search query**

Further, coding and analysis of the data were performed for all the nodes created in NVivo based upon above mentioned social capital indicators. Coding and analysis of data have excluded the references that have been found beyond the scope of social capital indicators definition. Coding of the LMS, PDRP, and Comprehensive Plan shows variation in reference scores for each social capital indicators. All reference scores are converted into percentages, and hierarchy diagrams are created for a better visualization of data. Hierarchy diagrams show the frequency of occurrence of codes in all the planning documents. Tables 2.2, 2.3, and 2.4 provide some examples of different types of social capital indicators found through the coding of the planning documents.

In the LMS plan, the maximum reference score was found for community participation followed by shared narratives and knowledge. The lowest reference score was found for social network and social relation. Community participation has a total of 142 reference scores whereas social network and social relation have only 5 and 6 reference scores respectively. Community participation received the maximum reference score of 53%, while social network received the lowest reference score of 4% (Figure 2.6).
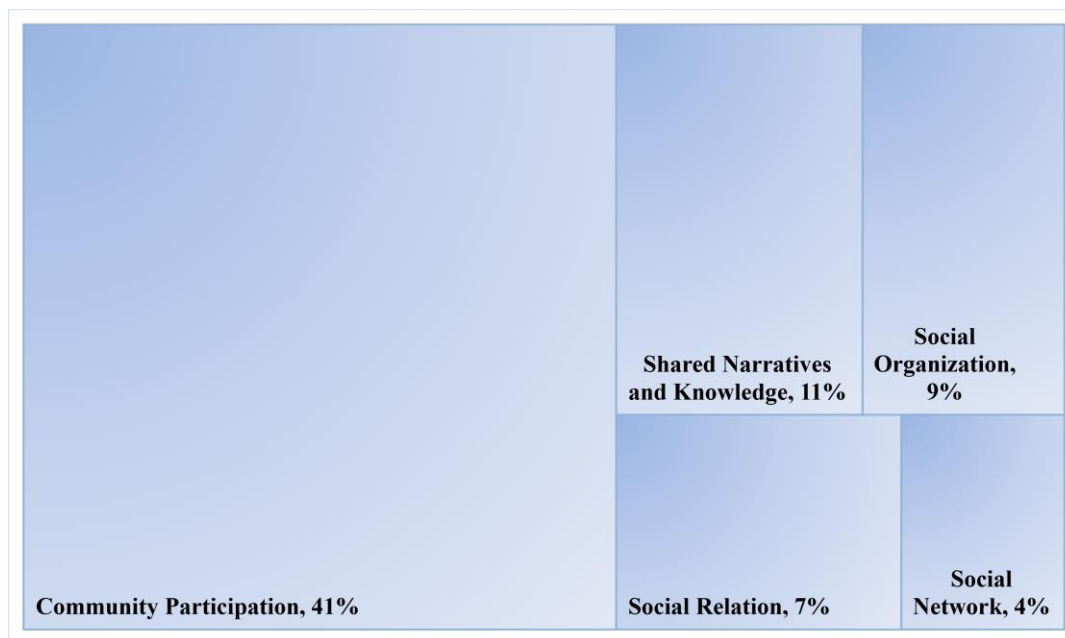
**Figure 2.6: Social Capital References (LMS)**

The LMS plan mentions that the involvement and participation of the community in disaster planning is mandatory under the "sunshine law of Florida". All the updates and meeting notices must be posted on the LMS webpage and on the administrative building for public comments and participation. However, the techniques to involve civil society, the identification of local groups and leaders, and the community's role in building social relations (social trust, social ties) is not explicitly mentioned. The plan briefly mentioned the role of knowledge for disaster and emergency response as one of the goals of the LMS plan. But, no guidance was given to foster collaborative learning and how to utilize community based shared knowledge for future hazard plans. The capabilities assessment of social/non-governmental organizations and ways to increase coordination between various organizations (governmental and non-governmental) were not discussed.

The plan does mention the coordination of inter-governmental agencies and coordination of County and Citizen Corps for mitigation programs; however, the importance

of vertical and horizontal relationship between community and agencies was not included. In

the goals and objectives section, the LMS plan recognizes the importance of addressing

special needs populations during pre and post-disaster recovery, without giving any further

details about any existing policies and programs. Indicators of social capital such as the role

of social relations and social networks are given minimal attention. Special assistance to

marginalized populations, identification of social heterogeneity as it relates to accessing

resources, and networks of multiple stakeholders for interactions and exchange of

information are not found as important elements in the LMS plan. Table 2.2 indicates some

examples of social capital indicators in the LMS plan.

**Table 2.2: Examples of Social Capital Indicators (LMS Plan)**

| | **Indicators** | **Examples** |
|---|---|---|
| | Community Participation | "LMS is a plan that a community can develop to promote hazard mitigation and to manage post-disaster recovery" (reference 2, 0.01% coverage) |
| | Social Organization | " develop DPPC subcommittees to address mitigation issues including- social agencies and the educational community" (reference 3, 0.01% coverage) |
| **LMS** | Social Relation | " recognize importance of addressing the needs of special needs population and the countywide dispersion of such population" (reference 4, 0.01% coverage) |
| | Social Network | " enhance the opportunity for securing mitigation grants by improving inter-governmental communication and coordination between County agencies, boards, municipalities, and neighboring counties". (reference 5, 0.01% coverage) |
| | Shared Narratives and Knowledge | "to rank critical facilities, each intergovernmental agency assigned scores based on their local knowledge and experience of the local situation and vulnerabilities" (reference 6, 0.01%coverage) |

In the PDRP, the maximum reference score was found for community participation

followed by social organization. The least reference score was found for shared narratives

and knowledge and social networks. Community participation received the highest reference

score of 28%, followed by social relation with 9% reference score, and social networks

received the lowest score of 4% (Fig. 2.7).
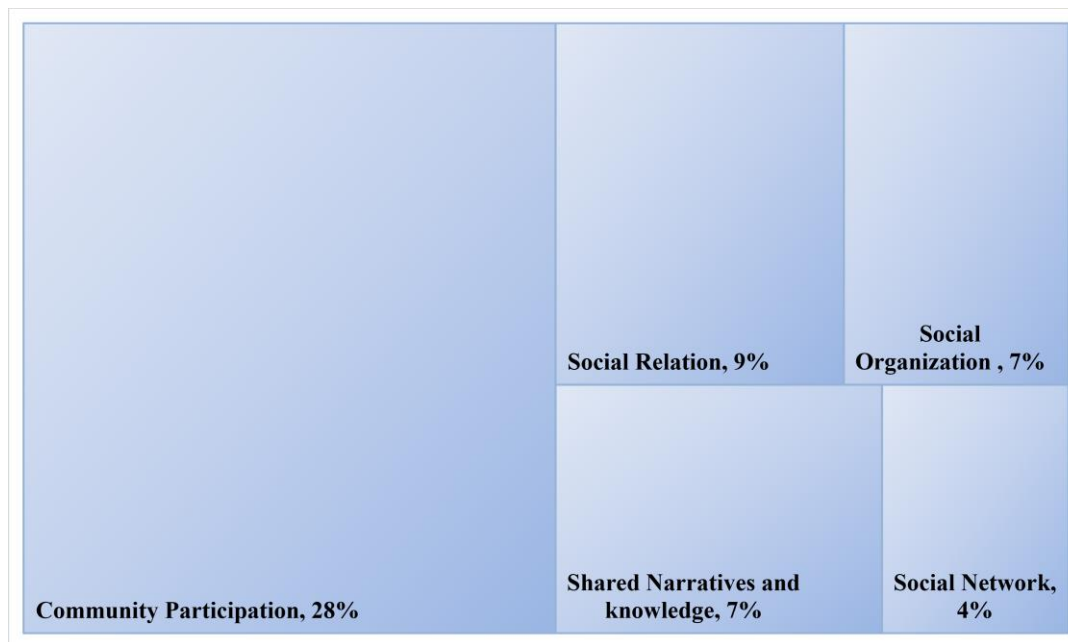


**Figure 2.7: Social Capital References (PDRP)**

PDRPs also put emphasis on the public participation process and community

involvement for short and long-term disaster recovery. During the development of the PDRP

document (2008), it was made accessible to the public by hosting open public meetings and

putting the draft plan on the County's website and in public libraries for review. However,

identification of community based local groups, local leaders, and the role of communities to

build social relations and development were not explicitly mentioned. The PDRP briefly

mentions that community service departments are designed to assist socially and/or

economically marginalized populations; however, the plan does not provide specific details

about any special assistance programs during the disaster event cycle. The plan mentions the

challenges related to migrant workers in terms of culture and economic barriers but does not address any specific efforts to help migrants and marginalized populations overcome challenges.

The PDRP includes a section on capacity assessment based on a variety of indicators and primarily includes technical, administrative, infrastructure, and fact-based planning assessment. The role of social networks is briefly mentioned only in terms of coordination of various governmental agencies for recovery planning. The importance of coordination between the community and agencies and non-governmental agencies has not been discussed. Under social service capacity, importance is given to identify and provide resources and programs to assist socially/economically marginalized populations without mentioning specific programs and policies that exist at the County level. Role of collaborative learning has also not been discussed. Table 2.3 indicates some examples of social capital indicators in the PDRP.

**Table 2.3: Examples of Social Capital Indicators (PDRP)**

| | Indicators | Examples |
|---|---|---|
| **PDRP** | Community Participation | "PDRP process involves individual citizen and community-based input for a greater understanding of local concerns" (reference 17, 0.02% coverage) |
| | Social Organization | "most of the social services provided in Manatee County are contracted out" (reference 4, 0.01% coverage) |
| | Social Relation | "coordinated with Emergency Management in developing strategies to address the pre-and post-disaster needs of special needs population (reference 8, 0.01% coverage) |
| | Social Network | " for effective coordination during emergency situations, Fire Districts, Sheriff's Office, Florida Department of Health, American Red Cross other participation agencies continue to meet through DPPC" (reference 12, 0.01% coverage) |
| | Shared Narratives and Knowledge | "PDRP repeat/clarify community vision and experiences to ensure that the general public understands the direction of community" (reference1, 0.02% coverage) |

In the Comprehensive Plan, a maximum score was found for the section outlining community participation followed by shared narratives and knowledge and efforts associated with social organizations. The least possible score was found for social relation and social network. Community participation received the highest score of 42%, followed by shared narratives and knowledge at 9%, and social network efforts received the lowest score of 3% (Figure 2.8).
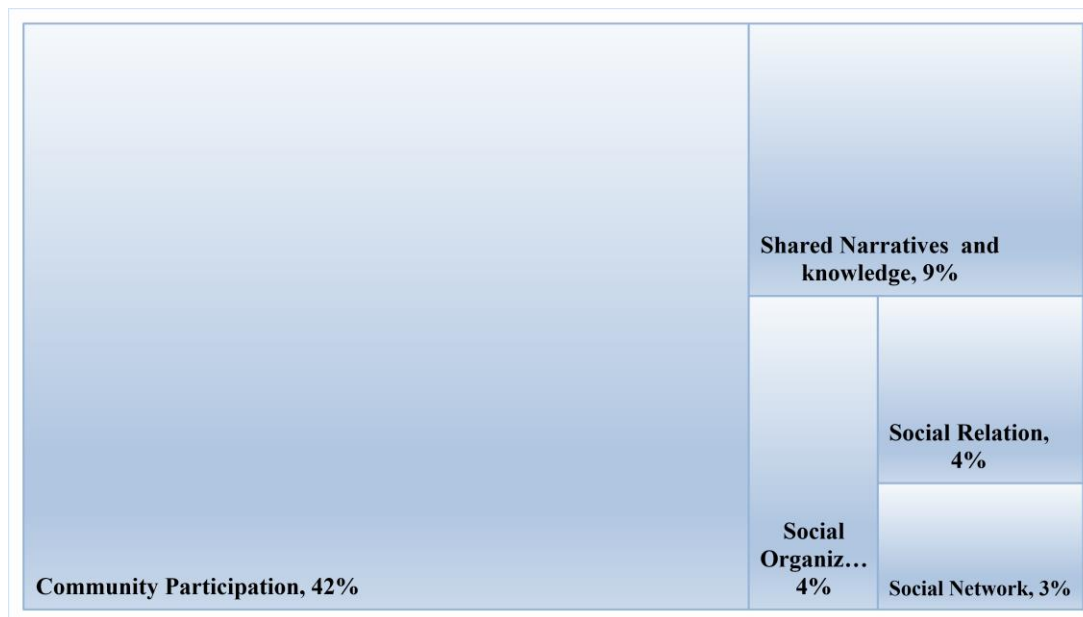
**Figure 2.8: Social Capital References (Comprehensive Plan)**

The Introduction section in the Comprehensive Plan describes the role of community

participation programs enacted to facilitate public input and comments during any major

plan revisions and recurrent plan amendments. Educational programs are mostly present to

deal with housing issues, cultural resources, technical and professional knowledge for

community development, and block grants development. One of the goals and objectives of

the Plan mentions the provision of adequate warning and efficient evacuation mobilization

during a hazard event; however, it does not include any special evacuation plan for socially

marginalized populations. The coastal element section mentions the importance of

coordination of governmental agencies and certified courses for local citizens as a part of

hazard mitigation emergency response. The role of social (non-governmental) organizations

is only mentioned briefly for the development of affordable housing. The roles of social

organizations and social networks are not explicitly discussed throughout the Plan. The role

of community based collaborative learning, importance of shared value and knowledge, and

identification of the role of social heterogeneity has not been discussed as an important

element for the planning. Table 2.4 indicates some examples of common social capital

indicators in the Comprehensive Plan.

**Table 2.4: Examples of Social Capital Indicators (Comprehensive Plan)**

| | Indicators | Examples |
|---|---|---|
| **Comp plan** | Community Participation | "establish community infrastructure program to determine public/private funding mechanisms to support community needs" (reference 89- 0.01% coverage) |
| | Social Organization | "community based non-profit organization- to assist in the provision of housing and related services on a non-profit basis and acceptable by federal and state agencies" (reference 2- 0.01% coverage) |
| | Social Relation | "increase housing opportunities to address the special needs populations; elderly, rural farmworkers, homeless, and physically disabled"" (reference 3- 0.01% coverage) |
| | Social Network | "coordination with other local governments and other adjacent counties to increase the role of evacuee mobilization during hurricane warning" (reference 14- 0.01% coverage) |
| | Shared Narratives and Knowledge | "The local governments of Manatee County recognized the importance of creating a shared vision for the physical development of our community" (reference 9-0.01% coverage) |

## 2.5.2 Interview results

Interview results from key stakeholders reveal that the existing role of social capital

is not explicitly mentioned in planning documents. Limited financial and human resources,

coordination among various agencies, and shelter capacity are resource constraints for

efficient recovery process and planning. It was mentioned that there is limited participation

of local stakeholders in the planning process and that the county needs to contract out to the

non-county staff to run the county programs (Emergency Management Chief, 2014, 2017).

For instance, the PDRP has very limited public participation and community involvement

efforts. It is primarily run by government officials and focused on redevelopment in the absence of social capital and social structure considerations. It was mentioned that even though County policy requires that every county staff member will work emergency events, there is still insufficient staff availability to deal with disaster events (Emergency Management Chief, 2014, 2017).

For the financial resources funds, Manatee County always utilizes localized funds before looking for other state or regional funding agencies. If funds are not available within the County, the Emergency Management office has established an EM Constellation, a statewide website to request services or resources from the state (only if not found locally). Further, the plans do not explicitly mention provision for long term shelter capacity for homeless populations, especially after the school ends its term as a shelter. It was also mentioned that the plans do need to incorporate cultural issues (linguistic and cultural barrier), and the role of social heterogeneity in emergency response, redevelopment, and recovery phase (Community Service Director 2014, 2017).

Various non-governmental organizations and religious organizations work as a part of the COAD (Community Organizations Active in Disaster) and VOAD (Voluntary Organizations Active in Disaster). However, social agencies are not heavily funded on a regular basis, and there is a lack of formalized planning to determine how each agency can function with mutual co-operation. Only a few social organizations (for example: United Way, Red Cross, Salvation Army) have a seat in the Emergency Operations Center, with their participation in the decision-making process for pre-event and post-disaster recovery being very limited. It was mentioned that there is a heavy reliance on social organizations

especially after the disaster event, but there is a very little understanding of the capabilities of these organizations (Salvation Army, 2014, 2017).

It was also mentioned that there has been a missing link of social capital in the entire disaster recovery and planning process. The role of social capital has been mostly found at the post-disaster recovery side, with a lack of consideration of social capital or social capital related organizations during the pre-event planning process. Interviewees also stated that challenges differ with each disaster. For instance, during hurricane IRMA (2017), major problems were related to low shelter capacity, power outage for almost 20 days in rural areas, and low involvement of non-governmental organizations due to their limited resources and capacity. It was mentioned that all low-income officials, non-governmental agencies, and all providers and contactors (except power companies) were evacuated during hurricane IRMA, and it was difficult to coordinate with the community for rescue and emergency response (Planning Official 2017). Table 2.5 shows the summary of interview responses.

**Table 2.5: Summary of Interview Responses**

| Topic(s) | Response(s) |
|---|---|
| **Resource Constraints** | Stated that biggest resource constraint is availability of staff at all levels, shelter capacity, and availability of finding especially for Non-Governmental Organizations |
| **Existing Reliance on Social Capital** | Commented that there is a reliance on social capital, but it is not explicitly mentioned in planning documents. Mentioned a little understanding of social capital. Noted limited understanding of capabilities of social services. |
| **Opportunities and Constraints for Social Capital** | Mentioned a missing link of social capital for disaster recovery process. Noted a lack of communication among and between organizations (governmental and non-governmental). Other constraints are cultural and socio-economic barriers. |

**2.6 Discussion**

Efficient hazard plans are a means to reduce loss of life and property through pre-event and post-disaster planning. Development of hazard plans, in this case study the PDRP, LMS, and a Comprehensive Plan, are a county's prerequisite in preparing for natural hazards and potential disasters and serve as primary tools to reduce community vulnerability and enhance resilience. Incorporation of structural and non-structural strategies is important to reduce damages and for overall community development. However, typical pre-event planning and post-disaster recovery processes often have limited incorporation of important non-structural measures such as social capital into their overall planning (Berke et al. 1993; Tobin 1999; Broady 2003; Godschalk et al. 2003; Berke et al. 2012; Frazier et al. 2013a). This research demonstrates the need to evaluate the presence of social capital in hazard plans and role of social capital in the planning and recovery process.

2.6.1 *Evaluation and coding of plan documents*

Evaluation and coding results from this research and the literature (Berke et al. 1993; Tobin 1999; Frazier et al.2013) indicate that there is often very limited incorporation of social capital in mitigation and recovery strategies in hazard plans. For instance, most referenced social capital indicators for this study are "community participation" followed by "social organizations," whereas the least mentioned indicators such as "social relation" and "social network," are both important to lowering vulnerability of marginalized population (Nakagawa and Shaw 2004; Airriess et al 2007; Colten et al. 2008;). This study and other work (Pelling and High 2005; Cutter and Emrich 2006; Colten et al. 2008; Smith and Boruff 2011; Chamlee-Wright and Storr 2011) shows that even though various facets of social capital such as social organizations, community participation, and social networks are

important to facilitate the disaster recovery process, minimal attention is given to ways to incorporate social capital in the preparedness and planning process. From this research, community participation in all planning documents briefly touches on issues of citizen participation; however, it does not truly explain how a citizen can participate in decision making process, if it is even possible. There are community programs like the Hurricane Expo hosted by Manatee County that aim to involve local people in the decision-making process and provide updates for the LMS plan. Still, the public participation rate and the inclusion of local organizations are limited in nature in the overall planning processes in the study area as well as in many other communities (Berke et. al. 2012; Frazier et al. 2013).

Analysis from evaluations shows that goals and objectives of planning documents also did not mention the role of social organizations and how social organizations can work together with governmental organizations during emergency situations. Quite simply, there is a need for local emergency management and community planning to better understand how to incorporate social capital into disaster preparedness and the response and recovery process. A better formalized training of social organizations and understanding of social structure can help to mobilize resources during a hazard event (Pelling 1998; Morrow 1999; Airriess et al. 2007; Aldrich 2011).

Destruction and damage by disasters are affected not only by the physical forces of the event, but also by the social structure and social system of a community. For example, the aftermath of Hurricane Andrew (1997) was not equally experienced by all the affected populations in Miami. Socially and politically marginalized populations with weak social ties and connections such as poor, single-family households, and women were the most affected by Hurricane Andrew (Morrow 1999), and in spite decades of progress this is still

the case today (Frazier et al 2013). For our study, there is some mention of special assistance to marginalized populations in planning documents, but the process that led to the development of these documents fails to advance specific policies to provide resources and funds to low socio-economic populations for resilience enhancement. Also, the DPRP acknowledges that the study area has a high number of migrants-which can lead to unique challenges because of the language and cultural barrier during a hazard event-without providing any specific policies or programs to support migrants during emergency response.

The role of social relation and social network are generally given minimal attention in disaster preparedness and planning as evidenced in all the three planning documents in our study area. This appears to be the norm across all forms of hazard planning (Frazier et al. 2013a). For example, programs and committees such as DPPC (Disaster Preparedness and Planning Committee) focus on the role of communication and coordination of only inter-governmental agencies for mitigation policies and planning process. However, the importance of multiple networks in terms of bonding, bridging, and linking social capital, and role of social networks to foster social and institutional trust, and reciprocal actions in the preparedness and planning process are not included. Further, the role of shared narratives and knowledge is mostly discussed in terms of existing educational programs for disaster awareness, without giving importance to collaborative learning to facilitate the two-way communication and bring pluralistic perspectives into the policy making and planning process.

2.6.2 *Responses of key stakeholders*

For this study, interview results indicate that there is limited understanding of social capital, which is often representative of hazards planning overall with historically very little

effort to incorporate social organizations, local community, the role of social networks, and understanding of social structures in preparedness and planning (Colten et al. 2008; Aldrich 2011; Smith and Boruff 2011; Frazier et al. 2013). The role of social capital, such as social organizations, has historically been mostly found at the post-disaster recovery side. Another challenge is lack of understanding of structure of social organizations, which leads to unclear knowledge of the existing and potential resources of these organizations especially during emergency response and recovery. Also, with the limited understanding of social networks, the role of bonding, bridging, and linking relationships has been ignored for the dissemination of knowledge, resource mobilization, immediate response, rescue, and redevelopment process.

2.6.3 *Final thoughts*

Planning documents in general are more focused on fact-based elements and structural mitigation and recovery measures, which is limiting in terms of mitigation and recovery opportunities. The inclusion of social capital in the planning process is limited with often only faint gestures to the need for community participation, and limited coordination of governmental agencies included in formal plans. To take better advantage of a broader range of potential mitigation strategies, especially in a time of diminished financial resources, planning documents need to add more detailed sections on understanding of community resources and capacity, ways to establish social relations (trust, reciprocity, social ties) to mobilize resources, formalized plans for social organizations, identification of networks among various agencies, and other non-structural measures. Hazards studies indicate that a low level of mutual cooperation, unclear mandate policies, low understanding of social structure, and uncoordinated network characteristics can impede or slow the

recovery process (Tobin 1999; Frazier et al. 2013a; Berke et al. 2012). As such, incorporation of social capital into the hazard planning and recovery process can be helpful for reduction of potential societal losses and should be better incorporated in the overall planning process.

Based upon the review of literature and evaluation of hazards plans of the study area, this chapter attempts to provide a few suggestions on ways to incorporate social capital into hazards plans.

- Create programs and committees to identify and monitor existing community resources, including lists of local groups involved in community services. Enhance communications between local community and hazards planning officials by periodically holding open public meetings to understand the community needs during a hazard event, and developing sense of belonging to the community, to foster trust, and reciprocal activities.

- Promote coordination between governmental and non-governmental organizations and promote involvement of social organizations into the decision-making process. Enlist social organizations involved in disaster response and recovery and recognize their capabilities in terms of shelter capacity, mass feeding, staff availability, equipment, and other resources.

- Formalize plans and standardize training for the local and non-governmental organizations to work with mutual cooperation and without duplicating the assistance during the response and recovery period.

- Give importance to understanding existing social heterogeneity in terms of racial and ethnic groups and social class for access and mobilization of resources, and better

understand existing community structure (close knit or diverse) for the future hazards scenarios, and to develop better evacuation strategies.

- Explicitly include policies and programs for the distribution of resources in special needs population such as migrants, the elderly, poor, and single-headed households during emergency response and recovery. Include a system for early warnings and evacuation strategies for socially isolated people.

- Give importance to multiple networks and informal connections such as specific community groups, religious organizations, and non-profits, and utilize a variety of networks for the mobilization of resources as well as dissemination of knowledge and information about hazards.

- Hold meetings, workshops, and other programs to incorporate collective human values and experiences, shared knowledge, and narratives of past hazard events so that these can be utilized as a reference for future hazard plans.

## 2.7 Conclusions

Results from this chapter demonstrate that non-structural measures such as social capital play a significant role in disaster recovery and need to be incorporated in hazards mitigation and recovery planning. In spite of the positive impact of social capital, evaluation of planning documents and interview results indicates that there is a limited incorporation of social capital in the PDRP, LMS, and Comprehensive Plan documents. One of the major findings of plan evaluations based on social capital indicators shows that various facets of social capital are not truly incorporated in the hazards and recovery plan.

The interview results with the key stakeholders indicate that the role of social capital has not been explicitly incorporated into hazards plans and the recovery process. Results

suggest that hazard planners and policy makers need to involve multiple stakeholders' skills and knowledge and incorporate social organizations into decision-making processes. They need to understand community social structure, enhance community participation, and utilize diverse social networks for resource distribution, and to facilitate social relation to create a more holistic disaster response and recovery plan.

## 2.8 Limitations

Evaluating planning documents based upon certain social capital indicators is a challenging task due to biases in indicators selection and the subjective nature of the research. Another challenge is coding the planning documents for social capital indicators because an overwhelming number of references of the social capital indicators within the data either just referred to the social capital indicators without further explanation or did not refer to any form of social capital. Further, indicators of social capital are highly interrelated and are difficult to evaluate in isolation. Also, some elements of social capital are tangible and easy to analyze such as social network and the role of social organization, whereas some elements are intangible and hard to define and analyze, such as level of trust, reciprocal actions, and shared values and experiences. Another significant constraint is the limited number of stakeholders for the interview (n=8). Limited sample size may not represent the holistic perspective on the role of social capital in recovery process and planning. Another limitation is that the analysis is based on a single county case study as the data source. Future work needs to incorporate a more comprehensive analysis and coding of planning documents and should incorporate a larger sample size to ensure researchers are supplying information to practitioners in a manner to assist in the complex decision-making required to result in enhancement of community resilience.

**Chapter 3: Modeling social networks of disaster recovery stakeholders to enhance social capital and facilitate disaster recovery process: A case study of Manatee County, Florida**

**3.1 Introduction**

Social capital as social networks has been considered important for the disaster response and recovery process. Social network analysis helps to understand how the structural relations and position of multiple stakeholders affects disaster recovery planning and processes (Doerfel et al. 2010; Pelling and Manuel-Navarrete 2011; Dempwolf and Lyles 2012; Kadushin 2012). Social networks can be defined as interactions of any social units to achieve a common good. In hazards literature, social network has been analyzed in terms of bridging, bonding (explains horizontal relationships), and linking (explains vertical relationships) social capital to facilitate efficient disaster recovery processes (Sabatini 2009; Hawkins and Maurer 2010; Tobin et al. 2016). Even though social networks of communities and various institutions have been examined, especially for the immediate relief, rescue operations, redevelopment, and recovery process, there is still a need to understand the social patterns and interactions of recovery stakeholders who can have positive or negative impacts on disaster recovery processes (Drabek 1985; Mileti 1999; Adger et al. 2005; Colten et al. 2008; Doerfel et al. 2010; Kwok et al. 2019). To create an efficient response and recovery process, it is crucial to understand the different positions and structures of multiple stakeholders who are involved in the recovery process.

Further, hazard literature identifies that non-profit stakeholders play a crucial role for immediate response and rescue processes even though these institutions have limited understanding of their role and responsibilities in the recovery network. Literature suggests that the local non-governmental organizations are not truly incorporated into the planning

and decision-making process (US.GAO 2008; Colten et al. 2008; Aldrich 2011; Pelling and

Manuel-Navarrete 2011; Kwok et al. 2019). Social networks of multiple stakeholders can

help to create collaborative planning, efficient communication, sharing of knowledge, and

mobilization of resources. Further, methodologies and tools of social network analysis have

not been thoroughly utilized in hazards literature to understand the structure of various

stakeholders involved in the disaster recovery process. This chapter analyses the structure

and position of disaster recovery stakeholders, particularly governmental and non-

governmental stakeholders, for the exchange of information and involvement in the

decision-making process in the recovery planning. Structure is defined in terms of social

structure that made up of a set of social units which can have different type of resources and

are connected to each other to access the resources. (Burt 1992; Lin 2001; Dynes 2005).

Social capital is defined as the resource embedded in social structure and social network and

can be mobilized by human actors (Lin 2001; Dynes 2005).

**3.2 Conceptual framework of social network analysis**

Social network is an interdisciplinary concept and primarily originated in sociology

and anthropology. Social network analysis can be understood by using social theories.

Social network analysis refers to the tools and methodologies to analyze network patterns

and structures. Social network analysis is distinguished from other social research as it

focuses on interactions among and between actors, and not only analyzes the attributes (such

as age, gender, sex) of actors. It helps to understand the interdependence of agencies and

social structures (Wasserman and Faust 1994; Knoke and Yang 2008; Kadushin 2012;

Borgatti et al. 2013). Social network analysis focuses on the structural relations and/or social

interactions that can vary across social contexts, whereas attributes remained unaltered across numerous social contexts (Wasserman and Faust 1994; Knoke and Yang 2008).

Social network analysis is based on the premise of structural approach. It measures and represents the social structures that operate at various scales (Knoke and Yang 2008; Freeman 2008; Kadushin 2012). Social network theory has been used to describe and study interactions between social units such as people, groups, organizations, countries, or any social entity (Lin 2001; Freeman 2008; Kadushin 2012). Social networks are comprised of two important components: actors and relations. Actors are defined as any social units such as individuals, groups, organizations, or regions. Relations are defined in terms of direct and indirect social ties among and between actors (Wasserman and Faust 1994; Knoke and Yang 2008). In social network analysis, it is not only the actors that create the social structure, but the relations among and between actors create the social structure. Identification and understanding of actors positions in a relation is important to conduct network analysis. Social network data are analyzed and represented by two interrelated techniques: graphs and matrices. Social network data can vary in different scales, ranging from individual actor, or pair of actors called dyad, the triple of actors called triad, a subgroup of actors, or the entire network (Wasserman and Faust 1994; Kadushin 2012).

The term "sociometry" was coined by Jacob Moreno (1946) to measure and visually represent the interactions and relations among the social actors. Sociomatrix is a two-way relational matrix of actors in the network data set. Graphs are also defined as a sociogram, which is a two-dimensional diagram to visually represent the relations among actors in a social system. Based on the graph theory, graphs are displayed in terms of nodes or vertices, and arc or edges. The nodes represent any social actors, and edges represent the relations

between the actors. Application of graph theory in social network analysis helps to identify

the most prominent actors in the network data set. The graphs can be directed and non-

directed depending upon the type of social ties existing between a pair of actors. The nodes

are defined in terms of qualitative and quantitative attributes and each node has unique

characteristics such as being female, 25 years of age, or stakeholder (Wasserman and Faust

1994; Knoke and Yang 2008; Freeman 2008; Borgatti et al. 2013).

Matrices are defined as mathematical expressions of the sociograms and are

displayed in tabular form called sociomatrix or adjacency matrix. Sociomatrices may

include binary value and nonbinary values depending upon the frequency and strength of

ties, and level of interactions. In a sociomatrix, the value of a cell for each row and column

is denoted as one if two nodes are adjacent, and zero if not adjacent (Knoke and Yang 2008;

Wasserman and Faust 1994; Borgatti et al. 2013). This research defines social actors as

stakeholders of social institutions who are involved in the recovery process. This research

utilizes both graph and matrix techniques to analyze the binary network dataset. The graphs

are non-directed and based on the adjacency matrix created from the dataset.

**3.3 Social network paradigm and disaster recovery**

Methods and tools of SNA have been applied to analyze public policy, collaborative

planning, land use planning, and environmental polices (Mandarano 2009; Innes and Booher

2010; Dempwolf and Lyles 2012). In hazards literature, social networks have been analyzed

in terms of bonding, bridging, and linking social capital at the individual and community

level for the access and mobilization of resources, immediate relief, and long-term

redevelopment processes. Social network has been mostly examined as a case study analysis

of hazards impacted communities for response and recovery (Nagawaka and Shaw 2004;

Sabatini 2009; Hawkins and Katherine 2010; Smith and Boruff 2011; Elliott et al. 2016).

However, the tools and mathematical algorithms of social network analysis to understand

the network structure of communities or institutions have not been thoroughly examined.

Seminal work of some social science scholars (Drabek 1985; Mandarano 2009; Lyles 2014;

Kwok et al. 2019) provides insights to understand the network characteristics of hazards

mitigation stakeholders, emergency response teams, and stakeholders involved in the

collaborative planning.

For instance, Drabek (1985) examined the role of multiple stakeholders involved in

emergency response teams especially for restoration and redevelopment and stated that lack

of coordination and communications among different types of agencies was one of the

greatest challenges in response and recovery networks. The article suggested developing

multiple stakeholder decision making processes by incorporating structural adaptations for

an efficient response and recovery process.

Mileti (1999) stated the importance of a collaborative hazards mitigation network of

multiple stakeholders, including emergency managers, community planners, and other local

stakeholders as an opportunity to incorporate diverse knowledge, experience, and resources

to create a sustainable hazards mitigation plan. The practice to minimize losses from natural

hazards including efficient warning systems, building codes, sound insurance policies,

innovative technology, emergency preparedness, and recovery depends upon the shared

decision-making process and communications among diverse stakeholders (Mileti and

Gailus 2005). The shared decision-making process involving diverse stakeholders can help

to include community specific needs, a better plan for future hazards scenarios, strong ties,

and effective communications to create a more localized and community specific emergency preparedness and disaster recovery plan (Dempwolf and Lyles 2012).

Kwok et al. (2019) have analyzed the role of diverse stakeholders including local leaders, policy makers, and emergency management practitioners for community resilience and to enhance social capital at the neighborhood level after hazard events. The study utilizes a mixed method approach to examine the role of bonding and linking social networks to enhance structural and cognitive social capital. The article suggested that enhancement of social capital for community resilience needs a better incorporation of local stakeholders and knowledge.

Different stakeholders are responsible for different aspects of recovery, and it is crucial to know what types of expertise, knowledge, and resources each stakeholder is bringing to the network. However, there is still limited understanding of how multiple stakeholders can work together to develop a collaborative network for the exchange of information and resources (Mileti 1999; Innes and Booher 2010; Castiglione et al. 2008; Kwok et al. 2016). Particularly, in hazards literature, there is little understanding of whether stakeholders from both governmental and non-governmental organizations are truly involved in the decision-making process, and exchange of information related to recovery policies (Mileti 1999; Kwok et al. 2016). Further, it is also a crucial factor to determine how much authority non-governmental stakeholders have for inclusion of their knowledge, information, and resources in recovery plan (Colten et al. 2008, Aldrich 2011).

This research takes a SNA (social network analysis) approach to analyze the structure and position of multiple stakeholders in disaster recovery process. Recovery stakeholders in this research, are primarily defined as agents' of social institutions such as

planners, NGOs officials, Emergency Management officials that work together to develop, design, and implement the recovery policies and plans. The conceptual and methodological approach of social network analysis enables us to understand the core and peripheral stakeholders involved in the recovery process, and how a broad range of stakeholders is involved in the recovery plan (Wasserman and Faust 1994; Kadushin 2012). Stakeholders of each organization bring different perspectives and assets useful to plan for an efficient recovery process such as knowledge, skills, experiences, information related to organization capacity, and authority to administer rules (Mandarano 2009; Johnston et al. 2012; Lyles 2014).

Specifically, involvement of multiple stakeholders can bring two types of skills and resources that may be helpful to plan for efficient recovery process: 1) skills and knowledge related to organizational capacity in terms of shelter capacity, human and financial resources, availability of equipment; 2) authority to involve planning process such as in drafting a plan, modifying regulations, suggesting new techniques, helping to bring community based needs, deeper understanding of budgets and funds allocation, and knowledge of community resources (Drabek 1985; Lin 2001; Adger et al. 2005; Dempwolf and Lyles 2012; Johnston et al. 2012; Kwok et al. 2016; Cutter 2016). Assessing the skills and assets of stakeholders in a disaster recovery network using SNA enables understanding of whether sufficient knowledge about disaster recovery capacity is present in the network, and if and how the network works to leverage skills and resources of all the stakeholders. This research particularly focuses on the network structure and position of non-governmental and governmental stakeholders in the recovery planning process.

### 3.4. Modeling social networks

There are various methods that have been used to analyze and model social networks, such as centrality, hierarchical clustering, correspondence analysis, clique, structural equivalence, multidimensional scaling, logit models, QAP regression, and blockmodels. The scale of analysis also depends upon the types of social networks dataset-sociocentric or whole network and egocentric or personal networks (McCarty 2007; Knoke and Yang 2008; Kadushin 2012). This research utilizes the concepts of centrality, structural equivalence, multidimensional scaling, and blockmodeling to analyze the structure and position of disaster recovery stakeholders in the decision-making process, and patterns of interaction.

**Centrality** helps to identify the prominent actors in a complete set of networks. Centrality is a measure of the number of ties of each actor with relation to other actors in any group or community. A prominent actor is involved with a maximum number of ties as compared to other actors. Centrality helps the analyst to understand the social capital of individual actors. There are various types of centrality measures such as degree, closeness, and betweenness (Freeman 2000; Knoke and Yang 2008). Degree centrality measures the degree to which an actor is connected to all other actors in the network or graph. It is binary and nondirected graph or network. Closeness centrality measures the geodesic distance of an actor as with all other actors in the set of networks. Geodesic distance is the shortest path connecting a pair of actors. It refers to how an actor interacts or communicates with others. Betweenness centrality measures the geodesic path of other actors that lies between pair of actors in a graph. It explains how nonadjacent actors' interactions potentially controlled by other actors in the network (Wasserman and Faust 1994; Borgatti et al. 2013).

This research utilizes the concept of degree centrality to measure the number of ties of each actor with others in the network. The highest possible centrality of this research is seventeen: as there are eighteen stakeholders in the network. Degree centrality measures degree value for number of ties, and index value of degree centralization.  Degree centralization measures the summarize value of how actors in a network differ to each other based on their individual centrality values. The index of degree centralization can be expressed by following equation (Freeman 1979; Wasserman and Faust 1994):

$$C_D = \frac{\sum_{i=1}^{g}[\, C_A\,(N^*) - \, C_A\,(N_i)]}{(\,g-1)(g-2)}$$

In this equation, $C_A\,(N^*)$ represents the observed largest degree centrality of actor in a given network, and the $C_A\,(N_i)$ represents the degree centralities of the g – 1 other actors (Wasserman and Faust 1994). The index centralization value ranges between 0 to 1. The value closer to zero indicates the network has evenly dispersion and not centralized. Whereas the value 1 or close to 1 indicates that the network has uneven dispersion and follows a centralized hierarchical pattern in a given network (Wasserman and Faust 1994, Borgatti et al. 2013). This research utilizes the concept of degree centrality to measure the number of ties of each actor with others in the network.

**Structural equivalence** is a term coined by Lorrain and White (1971). Two actors are structurally equivalent when they have very similar or identical ties with other actors in a network. Equivalent is defined as when actors have same structural role and position in the network. The definition of structural equivalence depends upon the different types of relations that exist in a social network. It is analyzed easily for multiple relations and dichotomous network graphs. It helps to analyze the position of actors in a set of graphs by

clustering similar actors together. This research utilizes the structural equivalence concept to analyze the blockmodeling of the network data.

**Multidimensional scaling (MDS)** is a data reduction technique and helps to visualize the social network data structure. There are two types of MDS- metric and non-metric. The non-metric MDS is useful for nominal or ordinal dataset whereas matric MDS is applicable for the valued dataset.  MDS helps to understand the similarities and dissimilarities based on distances among actors. This research utilizes nonmetric MDS to visually represent the network data into two-dimensional map. One of the popular data inputs to MDS is a one-mode symmetric matrix consisting of pairwise measures of similarity or dissimilarity (Dillon and Goldstein 1984). Usually, MDS output is comprised of two or three-dimensional plots (usually referred as maps) and displays that actors with similarities are closer to each other and dissimilar actors are located far from each other (Laumann and Pappi 1976; Wasserman and Faust 1994; Knoke and Yang, 2008). Nonmetric MDS output includes a diagram of the network structure by plotting data points in one- or two-dimensional map, based on the actors similarities or dissimilarities. The map can be compose of two, three or multiple dimensions, to shows proximity between objects spatially in a map. Proximity can be defined as any similarities or dissimilarities between set of objects (Dillon and Goldstein 1984; Borgatti et al. 2013). The nonmetric MDS evaluates goodness of fit of the data by stress index. The stress index measures the accuracy of the spatial map which represents the observed social distances among the actors. It ranges between 0 and 1. The nonmetric MDS performs monotone transformation to the dataset and only maintains the rank order of proximities. Monotone transformations of the data are called disparities and are used to analyze the adequacy of the reduced space in the diagram.

Stress can be defined by the following equation:

$$\text{Stress} = \left| \frac{\sum_{i \neq j}^{n} (d_{ij} - \hat{d_{ij}})^2}{\sum_{i \neq j}^{n} d_{ij}^2} \right|$$

In the equation, $\hat{d_{ij}}$ are the disparities and are monotonic (ordinal) values of the data

and define least square distances (Kruskal 1964; Kruskal and Wish 1978). And, $d_{ij}$ is the

distance between actors i and j as displayed in the map coordinates and computed from the

coordinates. (Kruskal 1964; Dillon and Goldstein 1984). The lower stress value represents

the measure of MDS being a good fit for the data, whereas the higher stress value represents

the measure of MDS being poor fit for the data.  Usually a value less than 0.2 is considered

acceptable fit for nonmetric MDS. The high stress values indicate that map is distorted and

not showing distance accurately (Kruskal 1964; Borgatti et al. 2013). The analysis presented

here utilizes the non-metric multidimensional to visually display the structure of

stakeholders based on similarities function, on the X and Y co-ordinates.

**Blockmodeling** is a mathematical technique to model the position of actors in a

social system. It is based on the premise of structural theories and helps to identify structural

patterns of networks. It deals with partition of networks based on grouping of people who

have similar relationships or who are structurally equivalent to other people (Wasserman

and Faust 1994; Doreian et al. 2005; Knoke and Yang 2008; Kadushin 2012). It is

essentially a data reduction technique and models the multi-relational network by clustering

similar actors and presenting aggregate-level information (Knoke and Yang 2008; Kadushin

2012). It was developed by White, Boorman, and Breiger (1976) to analyze social roles and

positions. According to Wasserman and Faust (1994), a blockmodel has two important

elements: 1) partition of sociomatrix of actors in the network into subsets defined as positions, 2) and analysis of the presence or absence of a tie within or between the position on each of the relations in a given network. The partition of sociomatrix of actors into submatrices or positions based on one or more relational networks is defined as a block. Each block represents the square submatrix of structurally equivalent actors and is defined as oneblock or zeroblock depending upon the presence or absence of ties (Wasserman and Faust 1994; Doreian et al. 2004; Knoke and Yang 2008).

Blockmodeling identifies clusters of any units (actors), in a given network that has some similar structural characteristics in terms of some relation R. Each cluster has units that share the units with similar connection patterns. Clusters form a partition C = ($c_1$, $c_2$,.......$c_k$), which is a special type of clustering of the set of units μ. P($C^*$) =$\min_{c \varepsilon \phi} P(C)$, where C is a clustering of a given set of units or actors' μ, $\phi$ is the set of all feasible clustering's, and P: $\phi \rightarrow$ IR is a criterion function. Each partition determines an equivalence relation. A block is a square submatrix, showing clusters of units that have very similar relations with the actors occupying the other blocks (Doreian et al. 2005; Knoke and Song 2007). A clustering C partitions the relation R into blocks and can be shown by following expressions

$$R (C_i, C_j) = R \cap C_i * C_j$$

Each block has units associating to clusters $C_i$ And $C_j$ and consists of all arcs from units in cluster $C_i$ to units in cluster $C_j$. A Blockmodeling consists of structures obtained by identifying all units from the same cluster of the clustering (C) (Breiger et. al. 1975; Wasserman and Faust 1994; Doreian et al. 2005).

Blockmodel analysis is represented in terms of partition block, density, and image matrices to display the pattern of ties for each block and for each type of relation. Blockmodel analysis can be conducted in several ways including CONCOR (Convergence of iterated Correlations) and hierarchical clustering (White et al. 1976). This research utilizes the CONCOR algorithm to analyze the disaster recovery stakeholders' network. CONCOR is one of the earliest methods to partition the actors based on structural equivalence of their positions. CONCOR helps to identify subsets of structural equivalent actors (Breiger et al. 1975; Wasserman and Faust 1994). It repeatedly calculates the Pearson correlation of coefficient between rows or columns of a matrix and creates a correlation matrix with value consisting of only +1 or -1. If actors have exact similar connections with all other actors, the correlation value will be +1, and when actors have opposite connections with all other actors the correlation value will be -1. A dendrogram represents the display of a series of partitions from CONCOR to show the degree of structural equivalence among the positions and clustering of actors. Further, the blockmodel analysis results in two outputs, a density matrix and an image matrix. In a density matrix cell, values are the densities which are calculated as number of observed ties divided by the possible number of ties in a permuted submatrix within and between blocks. An image matrix is extracted from density matrix and summarizes the ties between and within positions; each tie is coded as 1 or 0 by recoding cell density. Blockmodels have been applied in social science research to study interorganizational networks, patterns of communications, community structure, and world-system analysis. In this research, blockmodeling helps to identify communication patterns for the development of recovery polices. It also helps to understand the weak and strong ties among and between the stakeholders in the study area.

**3.5. Data and methods**

This chapter addresses the third and fourth research questions: How can the inclusion of social networks into response and recovery strategies facilitate disaster response and recovery? How can the inclusion of multiple stakeholders from both governmental and non-governmental institutions into the decision-making process lead to a more efficient recovery process? The overall approach taken to address these research questions was to survey recovery stakeholders via an interview process and then evaluate the responses via social network analysis.

**3.5.1 Stakeholder selection and interviews**

The selection and identification of recovery stakeholders have been based upon three important steps:

- Scheduled meetings (April 2014, May 2015, January 2016) with Emergency Management Chief and EOC department officers, and CPO (County Planning Officials) for their suggestions to identify key stakeholders from governmental and non-governmental organizations involved in the disaster planning.

- Attending and presenting part of the research work and objectives in one of the Disaster Preparedness and Planning (DPPC) meetings held in May 2015.

- Participation in one of the hurricane seasons meeting held in June 2015 to identify stakeholder involvement in hazards plan and recovery process.

This study uses a purposive sampling method to select stakeholders from both governmental and non-governmental organizations. Further, stakeholders were selected based on the DPPC (Disaster Preparedness Planning Committee) list provided by the EM office, which included the list of stakeholders involved in the decision-making process.

Based upon the recommendations from EM officers and DPPC list a total 30 stakeholders were selected for the interview process.

The stakeholders network data were collected through telephone interviewing during spring 2016. Telephone surveys have been used in many disciplines including medicine and health (Medford and Kapur 2014), public policy (Johnson 2014), psychology, and education (Toit 2016). Studies have found there is no significant difference between the response rate, conversation time, and information provided (Sturges and Hanrahan 2004; Holt 2010; Vogl 2013) between in-person and telephonic interview. The survey data were collected after the University of Idaho Institutional Review Board certified this research (IRB#15-840) as exempt on August 2015. First, an email including a brief research objective, questionnaire, and a request for their time availability was sent to thirty stakeholders. Based upon the recommendations from EM officers and DPPC list a total 30 stakeholders were selected for the interview process. Selection of stakeholders is also based upon their availability and email response.

After receiving responses from available stakeholders, a brief telephone survey was scheduled with each stakeholder based on their time availability. Out of 30, a total of 18 stakeholders were willing to participate in the telephone interview. The network data survey instrument is based on methods described by the Laumann and Knoke (1987), Knoke and Yang (2008), and Doreian et al. (2005) to collect data from stakeholders.

A brief telephone interview was developed to address fourth research question. These questions were designed to understand the information sharing network of stakeholders and analyze core and peripheral stakeholders in the recovery planning and

decision-making process. The following two questions were asked of each of the 18

participants in the interview.

1. How frequently do you communicate with other institutions in the process of developing your community's disaster recovery plan and policies? Is the nature of communication two-way, or just getting informed (one-way communication)?

2. Do you think your organization is central in the disaster recovery planning and decision-making process? If not, who do you think is a central organization?

**3.5.2 Social network analysis**

This research models network data of recovery stakeholders by performing degree

centrality analysis, blockmodeling, and nonmetric MDS methodologies to the adjacency

matrix of the network data set for the 18 recovery stakeholders. In the network data, each

node represents the stakeholders from the dataset. The result also shows the diagraph of

network data to display the interactions among nodes. The diagraph is showing all the 18

nodes and sets of ordered pairs for each node related to each other. This research utilizes

UCINET 6.0 (Borgatti, Everett, and Freeman, 1999) software to analyze the social network

data of recovery stakeholders. Adjacency matrix of the network data of recovery

stakeholders was created to run the above-mentioned methodologies. To run UCINET

software program correctly, it is important to format the data accurately before importing

them into the program. In UCINET, data can be imported directly as a file or can be cut and

pasted into DL (Data Language) editor.

Degree centrality was performed to understand the pattern of the network. The

output values of degree centrality show number of ties of each nodes (stakeholders) of the

data, as well as the degree value, and index of centralization score value of all nodes.

Additionally, generalized blockmodeling was preformed to understand the role and position

of the stakeholders, and nonmetric multidimensional scaling was employed to visually

represent the position of actors in a two-dimensional map. Generalized blockmodeling

output includes- initial correlation matrix, partition diagram for the relation blocked matrix

of each node, and density matrix, and R-square value of the correlation coefficient.

Blockmodeling was performed using the following steps:

| Network | → | Role & Position | → | Structural | → | CONCOR |
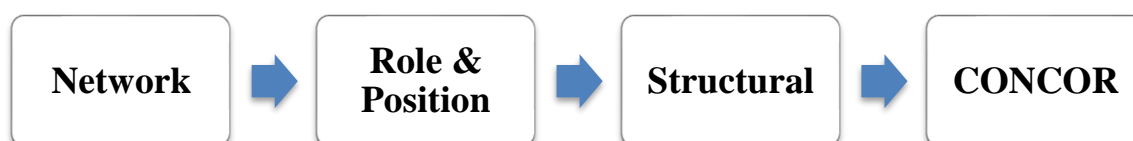
**Figure 3.1: Flow Diagram of Blockmodeling Analysis in UCINET**

To run the blockmodeling, the following steps as shown in Figure 3.1 were

performed. CONCOR procedure was done by setting, max depth of splits (not blocks) as 2

(default), convergence criteria as 0.200 (default), and maximum iteration as 25 (default)

performed on the matrix. The first correlation matrix was generated after the first iteration.

The convergence value ranges from 1 to -1, and the CONCOR was performed iteratively on

the correlation matrix until the convergence value reaches at 0.200. This correlation matrix

after convergence can split the data into two initially positively and negatively correlated

blocks. And, further split/partition of the network data is based on the setting of the

maximum iteration value to create more bocks and so on (Breiger et. al. 1975; Knoke and

Yang 2008). The method of blockmodeling in this research follows the techniques designed

by Knoke and Yang (2008) and Borgatti, Everest, and Johnson (2013). Further, the validity

of fit of network data in blockmodel depends upon the values of density table for each block.

The Fat fit is associated with all values as 1s, and Lean fit is associated with values as 0s for

each block. Finally, the image matrix is created from the values of density matrix for each

block. The alpha density cut off value is utilized to create the image matrix; this research utilizes density cut off value of 0.33 provided by Knoke and Yang (2008) for their work.

Nonmetric MDS was performed by applying following steps: Tools-Scaling/Decomposition-Non-Metric MDS. The non-metric MDS for this research selected number of dimensions as 2 and the starting configuration is set by default as Torsca which uses principal components of rank-order data, to generate initial location of points in two-dimensional space. The final output generates the scatterplot to graph the nodes on two-dimensional map and non-metric MDS coordinates with stress value. Blocks are drawn manually into the map to clearly represent the location of stakeholders in relation to each other.

**3.6 Results**

The Figure 3.2 below shows the diagraph of the network data to show the overall connections of each stakeholders. The blue nodes represent the governmental stakeholders, whereas red nodes represent the non-governmental stakeholders. The figure indicates that governmental and non-governmental stakeholders are not very well connected in the network data. The figure also shows that the non-governmental stakeholders are not very well connected among themselves as well.
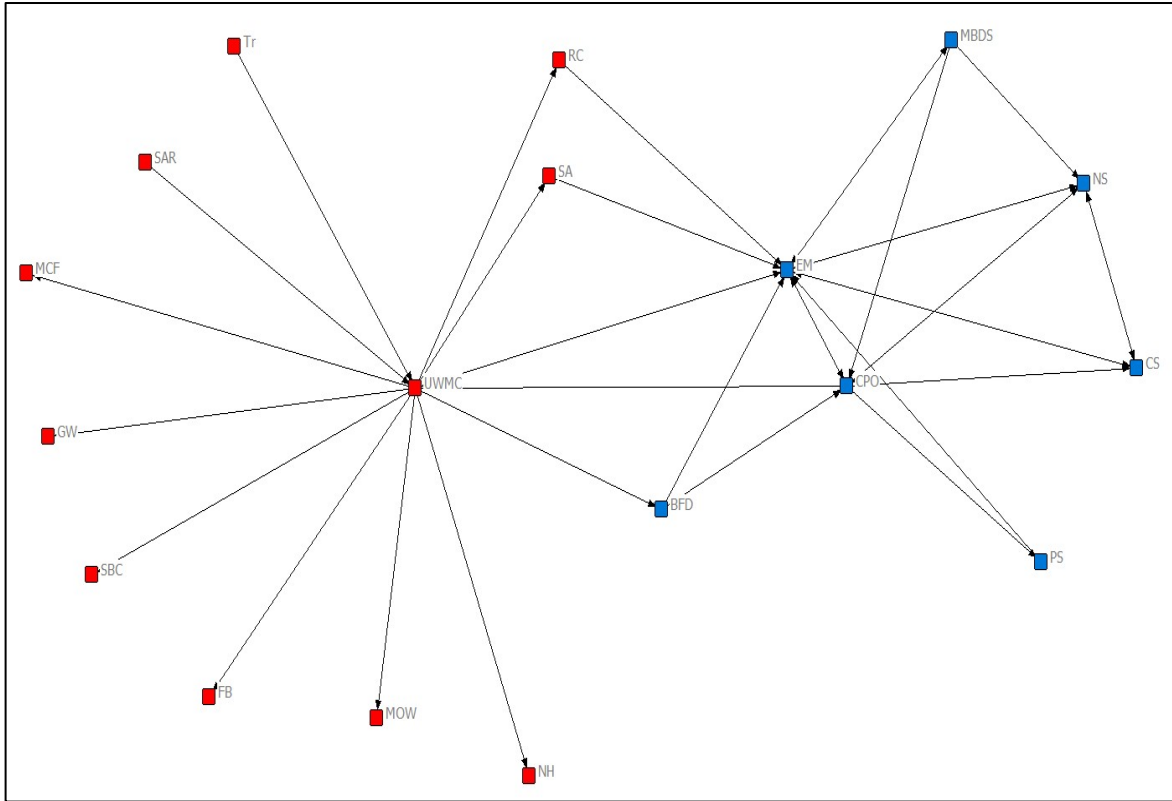
**Figure 3.2: Diagraph of Recovery Stakeholders**

Table 3.1 below shows the list of stakeholders for the interview and social network analysis.

**Table 3.1: List of Participants**

| Acronyms | |
|---|---|
| CS | Community Services |
| NS | Neighborhood Services |
| CPO | County Planning Official |
| EM | Emergency Management |
| MBDS | Building and Development Services |
| SA | Salvation Army |
| CCA | County Cultural Alliance |
| FB | Food Bank |
| MEA | Manatee Educational Association |
| CB | City of Brendantion |
| UWMC | United Way |
| MOW | Meels on Wheels |
| MCF | Manatee Community Foundation |
| GW | Good Will |
| RC | Red Cross |
| Tr | Tropicana |
| BFD | Bradenton Fire Department |
| PS | Public Safety |
| NH | Network of Hope |
| SBC | Southern Baptist Convention |
| SAR | Search & Rescue |

**3.6.1 Centrality analysis**

The results of centrality analysis show the network density of ties by calculating the number of ties of each stakeholder with all possible stakeholders in a network, and index of network centralization. The Figure3.3 and Table 3.2 indicates the degree centrality of stakeholders. For this study, the highest possible degree centrality is 17 as there are total 18 actors in the network. The results in Figure 3.1, show how stakeholders are connected in the recovery network. It is based on the degree value calculated for each node listed in Table 3.2. Only stakeholders of three institutions—Emergency Management, County Planning

Office, and United Way—are found to be central in the decision-making process for

recovery polices. The role of most of the non-governmental stakeholders is peripheral, with

a lesser number of ties in the decision-making process.
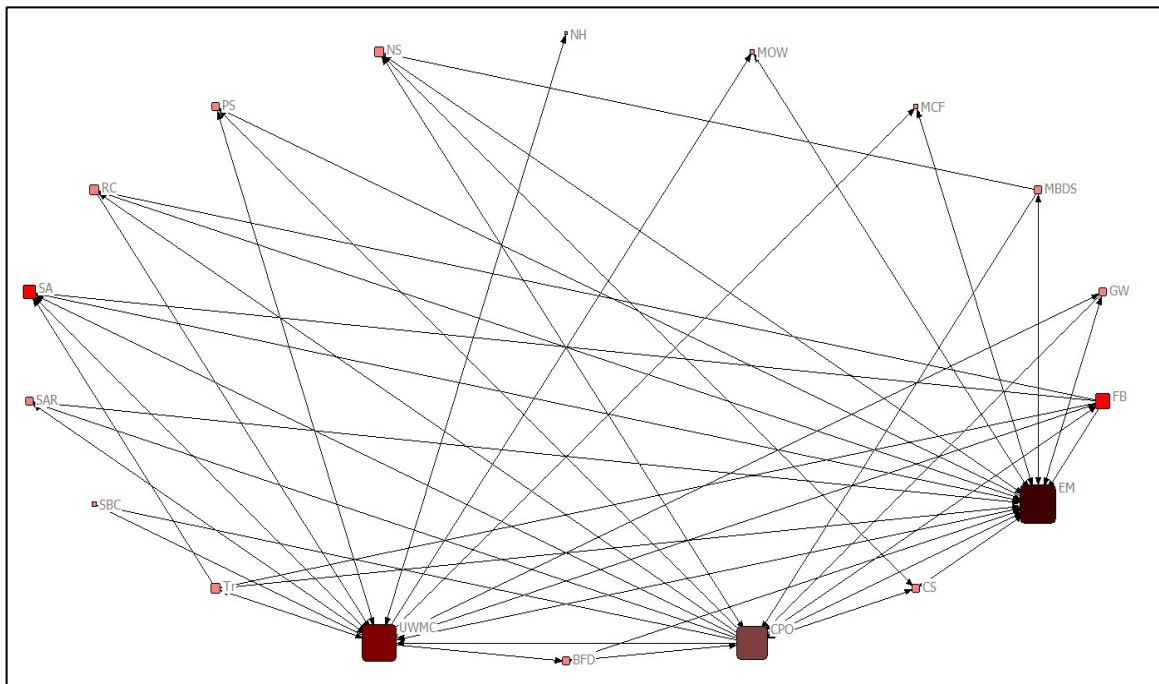


**Figure 3.3: Degree Centrality of Stakeholders**

Table 3.2 below shows the value of degree centrality of all stakeholders. The table is

color coded into two categories, the blue color code represents the stakeholders who falls in

the degree value from 1 to 5. Whereas the orange color code represents the stakeholders who

falls in the degree value ranges from 5 to 10. The high degree value indicates the higher

number of ties.  The result indicates that only three stakeholders have a greater number of

ties, whereas most of stakeholders have a lower number of ties. It shows that stakeholders

are not very well connected and are not truly incorporated in the decision-making process.

The value of degree centralization is 0.6544 and indicates that the data has less dispersion.

The higher value of degree of centralization indicates that the network data are more uneven and follow hierarchical pattern.

**Table 3.2: Degree Centrality of Stakeholders**

| Stakeholders | Degree | n Degree |
|---|---|---|
| Community Services (CS) | 3 | 0.176 |
| Neighborhood Services (NS) | 4 | 0.235 |
| County Planning Official (CPO) | 7 | 0.412 |
| Emergency Management (EM) | 9 | 0.529 |
| Building and Development Services (BDS) | 3 | 0.176 |
| Salvation Army (SA) | 2 | 0.118 |
| Food Bank (FB) | 1 | 0.059 |
| Network of Hope (NH) | 1 | 0.059 |
| United Way (UWMC) | 8 | 0.665 |
| Meels on Wheels (MOW) | 1 | 0.059 |
| Manatee Community Foundation (MCF) | 1 | 0.059 |
| Good Will (GW) | 1 | 0.059 |
| Red Cross (RC) | 2 | 0.118 |
| Tropicana (TR) | 1 | 0.059 |
| Bradenton Fire Department (BFD) | 2 | 0.176 |
| Public Safety (PS) | 2 | 0.118 |
| Southern Baptist Convention (SBC) | 1 | 0.059 |
| Search & Rescue (SAR) | 1 | 0.059 |

　　　　　　　□ **1-5 (degree value),**　　　□ **5-10 (degree value)**

### 3.6.2 Blockmodeling of the stakeholders network

The final output of blockmodeling included in the partitioned relation block matrix and density matrix. From the density matrix value, an image matrix is created for each partitioned blocked.

```
                   1 1                 1   1   1 1                1 1 1
           1 2 6 5 5       4 3     1 9 0 6 4 3        8 7 2 7 8
           C N P B M       E C     M U M S T R        N F G S S
          ------------------------------------------------------------
 1   CS |   1         | 1     |                   |             |
 2   NS | 1           | 1 1   |                   |             |
16   PS |       1     |   1   |                   |             |
15  BFD |             |       |                   |             |
 5 MBDS |       1   1 | 1     |                   |             |
          ------------------------------------------------------------
 4   EM | 1 1 1   1   |     1 | 1   1   1         |     1       |
 3  CPO | 1 1         | 1     |     1             |             |
          ------------------------------------------------------------
11  MCF |             |       |                   |             |
 9 UWMC |       1 1   | 1     | 1       1     1   |   1 1       |
10  MOW |             |       |                   |             |
 6   SA |             | 1     |     1             |             |
14   Tr |             |       |                   |             |
13   RC |             | 1     |                   |             |
          ------------------------------------------------------------
 8   NH |             |       |                   |             |
 7   FB |             | 1     |         1   1     |       1     |
12   GW |             |       |   1               |             |
17  SBC |             |       |                   |             |
18  SAR |             |       |                   |             |
          ------------------------------------------------------------
```

**Figure 3.4: Blocked Relation Matrix of Recovery Stakeholders**

The Figure 3.4 represents the blocked relation matrix of 18 stakeholders from both governmental and non-governmental institutions. The blocked matrix is divided into total 4 main blocks and each block includes 4 sub-blocks. Tables 3.3 and 3.4 represent the density matrix and image matrix of the blocked matrix.  Results of the block matrix in Table 3.3 indicates that network dataset is divided into four blocks. Block 1 includes following institutions- Community services, Neighborhood Service, Public Safety, Bradenton Fire Department, Building Development Services. Block 2 includes following institutions-

Emergency Management County Planning Official. Block 3 includes following institutions-

Manatee Community Foundation, United Way, Meals on Wheels, Salvation Army,

Tropicana, Red Cross. Block 4 includes following institutions- Network of Hope, Food

Bank, Good Will, Southern Baptist Convention, Search and Rescue Block 1 and Block 2

represent mostly stakeholders from governmental institutions, whereas Block 3 and Block 4

represent mostly non-governmental organizations. Block 2 represents the most prominent

stakeholders with highest density value including Emergency Management and County

Planning Officials with high communications ties with other stakeholders. Block 4

represents least prominent stakeholders in terms of communication with other stakeholders

with lowest density value including some of the non-government institutions and shows very

low communication ties for developing disaster recovery polices. The results of image

matrix which is based on the alpha density cut off value as 0.33, indicates that Block 1 and

Block 2 most frequently exchange information related to disaster recovery polices. Whereas

Block 3 and Block 4 least frequently exchange information related to recovery policies.

**Table 3.3: Density Matrix**

|         | Block 1 | Block 2 | Block 3 | Block 4 |
|---------|---------|---------|---------|---------|
| Block 1 | 0.350   | 0.813   | 0.000   | 0.000   |
| Block 2 | 0.700   | 1.000   | 0.295   | 0.092   |
| Block 3 | 0.027   | 0.281   | 0.341   | 0.067   |
| Block 4 | 0.000   | 0.012   | 0.231   | 0.013   |

**Table 3.4: Image Matrix**

|         | Block 1 | Block 2 | Block 3 | Block 4 |
|---------|---------|---------|---------|---------|
| Block 1 | 1       | 1       | 0       | 0       |
| Block 2 | 1       | 1       | 0       | 0       |
| Block 3 | 0       | 0       | 1       | 0       |
| Block 4 | 0       | 0       | 0       | 0       |

Figure 3.4 below shows the nonmetric multidimensional scaling analysis of the structure of stakeholders network dataset. This two-dimensional map is created based on the SIMILARITIES function of nonmetric MDS It represents the two-dimensional map of actors by showing the similarities dissimilarities patterns present in the network. The stress level value of 0.09 represents good fit of data for the analysis. The blocks are drawn manually to show the similarity pattern of stakeholders in the map. The map shows a clear pattern of ties, as stakeholders of governmental institutions are clustered in Blocks 1 and 2, whereas the stakeholders of non-governmental agencies are clustered in Blocks 3, and 4.
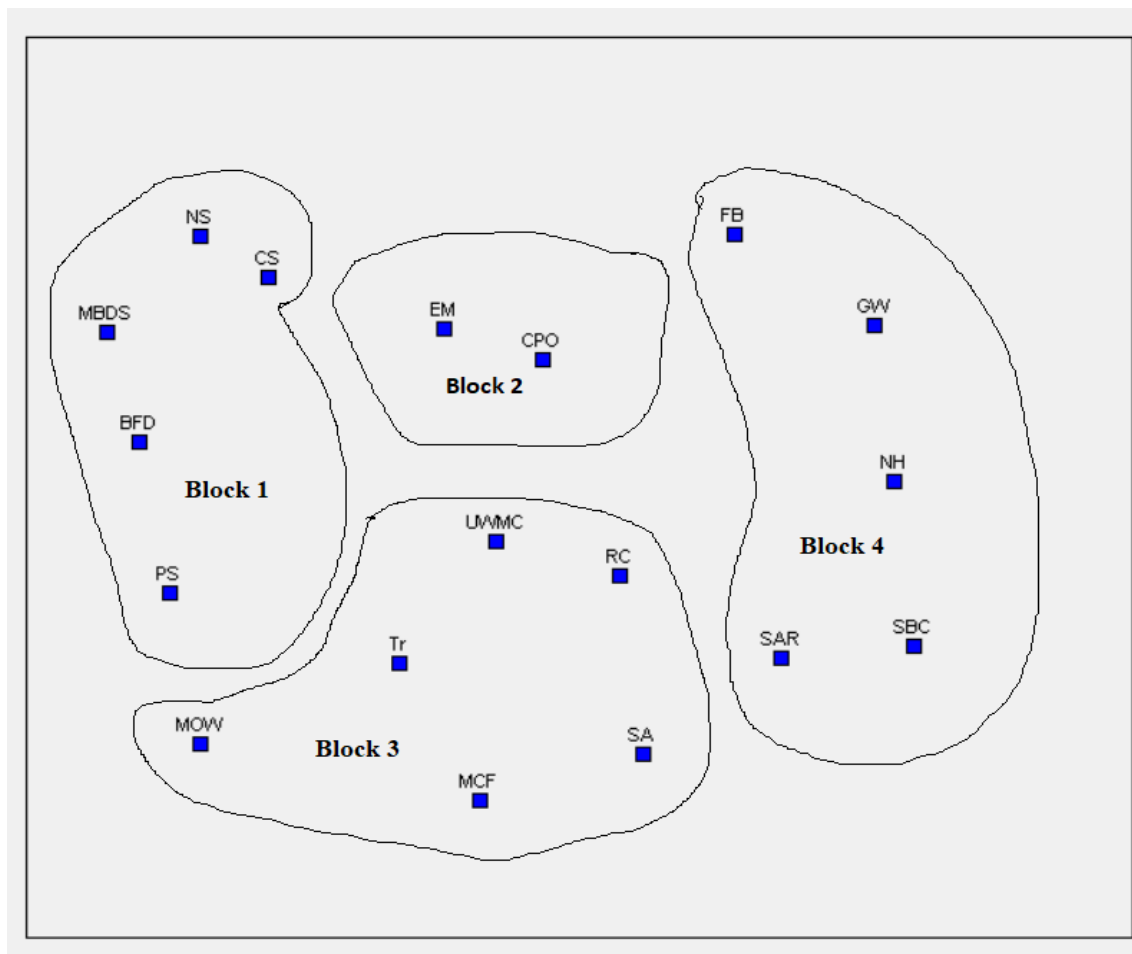


**Figure 3.5: Multidimensional Scaling with Blocks in Recovery Stakeholders**

**3.7 Discussion**

Social network analysis helps us to understand the structure and pattern of stakeholders involved in the disaster recovery planning and process. In hazards literature, social network has been analyzed in terms of bonding, bridging, and linking social capital without using specific tools and methods of social network analysis to understand the structure and pattern of various types of networks (Drabek 1985; Hawkins and Maurer 2009; Kwok et al. 2016). Additionally, social network is analyzed mostly to understand the network composition, attributes, and types of network. Little work has been done to understand the structure of social networks in terms of interactions and position analysis of stakeholders (Wasserman and Faust 1994; Knoke and Yang 2008; Elliot et al. 2010).

Social networks of communities and organizations have mostly been examined as case studies analysis after hazard events occurred. Social networks have been understood in terms of roles of weak and strong ties, and the scale of analysis is usually at the individual and the community level of those who are involved in the recovery process. However, the tools and mathematical algorithms of social network analysis to understand the network structure of stakeholders who are involved in recovery polices have not been thoroughly examined. Effective recovery process and planning needs to consider in advance various issues including how frequently various stakeholders are involved in the decision-making process, and what is the role of these stakeholders (Mileti 1999; Dynes 2003; Smith and Wanger 2006; Johnston et al. 2012).

This research and other studies (Drabek 1985; Mileti 1991; Rubin 2000; US. GAO 2008) demonstrate that the interactions of multiple stakeholders are not well connected in terms of two-way communication. The results also show that local non-governmental

institutions are not truly incorporated in the development of disaster recovery planning and polices. However, literature (Drabek 1985; Mileti 1991; Adger et al. 2001; Aldrich 2011) identifies that involvement of multiple stakeholders is important for efficient communications, immediate relief, and the redevelopment process.

Results from centrality analysis indicate that core stakeholders are few in number and most of the stakeholders are peripheral in the decision-making process. The core network for recovery and planning is primarily comprised of Emergency Management Officials and County Plan Officials, whereas other stakeholders, especially local non-governmental stakeholders, are situated at the periphery. Additionally, the high value of centralization shows that network structure is less diverse and follows a hierarchical pattern. The results also indicate that only a few non-governmental stakeholders such as United Way, Salvation Army, and Red Cross have a seat in the Emergency Operations Center, with their participation in the decision-making process for pre-event and post-disaster recovery being very limited.

Modeling results indicate that there is a disconnect in communication, especially between governmental and non-governmental stakeholders. Social network modeling indicates that strong ties exist between governmental organizations, and weak ties exist between governmental and non-governmental organizations. Results of matrices show that there is clear cleavage of governmental and non-governmental stakeholders for exchange of information. The matrices are divided into four blocks. Block 1 and Block 2 consist of governmental stakeholders with high density value and frequent ties. Block 3 and Block 4 consist of non-governmental stakeholders with low density value and less frequent ties. The social map of MDS further represents the stakeholders in four different blocks. Different

stakeholders are responsible for different aspects of recovery, and it is crucial to know what types of expertise, knowledge, and resources each stakeholder is bringing in the network. However, there is limited understanding of how multiple stakeholders can work together to create a collaborative network for the exchange of information and resources during hazard events (Dynes 2005; Innes and Booher 2010; Johnson et al. 2012).

Even though the social networks of communities and various institutions have been examined, especially for the immediate relief, rescue operations, redevelopment, and recovery processes, there is still a need to understand the social patterns and interactions of recovery stakeholders who can have positive or negative impacts on the disaster recovery process (Drabek 1985; Mileti 1999; Adger et al. 2005; Colten et al. 2008). To create an efficient response and recovery process, it is crucial to understand the different positions and structures of multiple stakeholders from both governmental and non-governmental sides who are involved in the planning process. Inclusion of multiple stakeholders into recovery planning and coordination can lead to a more informed, need-based recovery policy and practice for community resilience. Exchange of information and frequent communications between various stakeholders can lead to efficient warning systems, better evacuation strategies, and mobilization of resources during hazard events.

## 3.8 Conclusions

This chapter demonstrates that communications of multiple stakeholders for disaster recovery and planning is mostly absent; this involvement is necessary to develop holistic recovery process and for the access and mobilization of resources during and after hazard events. Literature suggests that inclusion of multiple stakeholders is crucial for better response and recovery. Further modeling of social networks helps to understand the current

role and position of multiple stakeholders involved in the decision-making process. A better understanding of the structure of stakeholders helps to understand the existing patterns of communication as well as how it can be improved over time. Although the results of this chapter could be qualitatively predicted by hazard scholars, this research attempted to quantify the structure of recovery stakeholders in order to confirm and strengthen the informed thinking of experts in the hazards field.

Social networks of multiple stakeholders can help to create efficient communications, sharing of knowledge, and mobilization of resources during hazard events. The research also suggests that recovery plans and policy development should incorporate the perspectives of multiple stakeholders from various institutions. A decentralized and non-linear network structure of stakeholders can have positive impacts on pre-event and post-disaster recovery process.

# Chapter 4: Understanding opportunities and constraints of structural social capital for short and long-term disaster recovery: A case study of Manatee County, Florida

## 4.1 Introduction

Structural social capital has been considered a crucial element for disaster response and recovery. The structural dimension of social capital includes social institutions and their capacity to work with cooperation to achieve a common good. For efficient recovery process and to enhance community resilience, it is crucial to have strong and robust social institutions (North 1990; Krishna and Shrader 1999; Uphoff 2000; Woolcock and Narayan 2000; Adger 2003). The structural approach of social capital emphasizes the role of various social institutions to access and mobilize resources, facilitate communications, and make well-informed decisions (Nahapiet and Ghosal 1998; Dasgupta and Serageldin1999; Uphoff 2000; Woolcock and Narayan 2000; Agarwal 2001; Brody et al. 2010; Pelling and Manuel-Navarrete 2011). Research in hazards and climate change literature has mentioned the role and importance of structural social capital and has proposed that well-integrated social institutions (governmental and non-governmental) can improve resource management, better response and recovery strategies, and flow of information and communications during emergency response periods (Drabek 1985; Pelling 1999; Woolcock and Narayan 2000; Adger et al. 2001; Murphy 2007). Agents of social institutions can serve as potential links between community and institutions to develop, design, and implement disaster preparedness and recovery policies and programs for community development (Pretty and Ward 2001; Adger et al. 2001).

The hazards and climate change literature put emphasis on the importance of social institutions for the purpose of disaster recovery; however, how capabilities of social

institutions can impact the recovery process has not been thoroughly analyzed. For better utilization of social institutions, it is important to assess the factors that strengthen or weaken the social institutions contributing to disaster response and recovery trajectories (Uphoff 2000; Islam and Walkerden 2015). Little work has been undertaken to understand factors that influence the capabilities of social institutions and how they can affect disaster recovery and community resilience. Drawing from the hazards and social science literature (Uphoff 2000; Woolcock and Narayan 2000; Murphy 2007; FEMA 2018), this research tries to understand the factors affecting the capabilities of structural social capital and their subsequent impact on disaster recovery processes. A holistic capabilities assessment that considers both governmental and non-governmental organizations will help to improve our understanding of the opportunities and constraints of structural social capital for disaster preparedness and recovery. To understand the factors affecting the opportunities and constraints of structural social capital of institutions, this chapter analyzes the association between structural social capital of institutions and their capabilities for disaster preparedness and recovery. Further, this research also analyzes how agents of social intuitions perceive the community social structures, importance of collaborative efforts, and public participation for preparedness and recovery.

**4.2 Analyzing structural social capital into response and recovery**

Structural social capital is defined in terms of social institutions and specifically incorporates their rules, procedures, and networks to facilitate collective action for mutual benefits (Granovetter 1985; Granovetter 1992; Burt 1992; Ghosal and Nanphiet 1998; Portes 1998; Uphoff 2000; Aldrich et al. 2018; Scott 2017). This research defines social institutions in terms of both governmental and non-governmental institutions. Important aspects of

social institutions are network of relationships, the density or ties of network, connections, and interdependence/ interactions between any social units (Burt 1992; Granovetter 1992; Wasserman and Faust 1994; Ghosal 1998; Portes 1998; Castiglione et al 2008). This research includes three main components of structural social capital in the context of disaster response and recovery process: network of agencies for exchange of resources and information, frequency of participation in community recovery planning, and professional interactions of agencies.

The network ties of social institutions and density of networks plays a crucial role for the access and mobilization of resources as well as exchange and flow of information in a more efficient manner (Burt 1992; Granovetter 1992; Knack and Reef 1997; Nanphiet and Ghosal 1998; Dasgupta and Serageldin 1999; Uphoff 2000). Strong and robust social networks of institutions have been considered an important part of efficient disaster recovery processes (Adger et al. 2001; Colten et al. 2008). Structural social capital facilitates collaborative efforts through strong social ties and networks, and with better and structured communication. Strong structural social capital is usually associated with a high level of interactions and coordination (Bourdieu 1986; Coleman 1990; Nanphiet and Ghosal 1998; Uphoff 2000). Professional interactions among and between agencies, interconnectedness, and frequency of participation in planning and policies are important for designing and developing recovery plans (Cutter et al. 2006; Brody et al. 2010). Frequency and rate of participation measures how actively any agencies are involved in activities associated with formal or informal institutions. Studies have found that high rates of participation of both governmental and non-governmental agencies in planning and decision-making processes

can create high quality plans and recovery processes (Berke et al.1993; Godschalk et al. 2003; Gordani and Murphy 2010).

Structural social capital affects the disaster recovery process via capacity of social institutions, as the slight changes in capacity of institutions ultimately impact the overall connections of institutions to deal with emergency response and recovery processes (Uphoff 2000). This research focuses on both short-term response periods and long-term disaster recovery processes for ensuring a community's improvement, both immediately and long after a disaster event.

After hazard events, recovery and response efforts require the help and contributions of various institutions (Adger et al. 2001; Harrald 2006). The efficiency of recovery planning and polices efforts can be impacted by multiple factors such as involvement of informal social institutions, mutual understanding of agencies, density of networks, inclusion of local knowledge, and local support (Quarantelli1999; Berke et. al. 1993; Burton et al. 2011). Hazards and climate change scholars (Pelling 1999; Adger 2003, Cutter and Emrich 2006; Colten and Stumper 2009) have been analyzing the role and importance of social institutions for disaster response and recovery and have argued the importance of interdependence among social institutions to promote community resilience. Adger (2003, 2005) highlighted the importance of informal collective decision-making process for coastal resource management after a hazard event. These articles suggested that to create a resilient community it is important to involve human agency, interaction and cooperation of institutions, strong networks, and inclusion of diverse institutions in planning and policy making.

Pelling (1999) highlighted the importance of social structures and institutions for the access and mobilization of resources. The article puts emphasis on involvement of local non-governmental institutions in the decision-making process, and decentralized planning to promote and develop local social capital to enhance community resilience. The article analyzed the high flood risk areas in Guyana and concluded that lack of involvement of local institutions, low level of community participation, and non-flexible funding opportunities can lead to differential rates of recovery. Seminal work of scholars (Elliot and Pais 2006; Colten and Stumper 2009; Airriess et al. 2007) analyzed the post disaster recovery process of hurricane Katrina (2005) in New Orleans. They found that local social capital rich institutions were actively engaged in the emergency response process by providing the necessary resources and had been easily accessible by local communities in the response and recovery process. However, there was a poor coordination between governmental and non-governmental institutions during emergency response and recovery process, and local institutions were not truly incorporated into the disaster response teams. Additionally, there was a lack of knowledge of the capacity and resources of these local institutions (Colten et al. 2008; Patterson et al. 2010).

Nelson et al. (2007) analyzed the post disaster recovery planning process following the aftermath of hurricane Katrina (2005) in New Orleans. The article addressed the multiple problems related to post disaster recovery phases such as lack of communication between agencies and residents, lack of coordination among and between various institutions, and lack of collaborations among various stakeholders. An efficient recovery planning process needs to encourage participation among and between agencies as well as residents to exchange information, share resources, and create informal networks.

Dynes (2005) analyzed the role of social systems and existing social structure to deal with disaster response and recovery. The article suggested that a better understanding of capacity of existing social units as well as a well-coordinated and decentralized decision-making process can help to deal with emergency situations in a more efficient manner. Involvement of local community-based organizations in the planning process and a better understanding of the existing social structure can help to cope with hazard events. Aldrich (2011) analyzed the recovery process after a massive earthquake hit the city Kobe in Japan in1994). He found that local social capital rich organizations were the most robust indicator for the disaster recovery process.

Previous work in hazard and climate change literature has shown that involvement of social institutions and understanding of structural social capital plays a crucial role in the successful disaster recovery process. This study analyzed how capabilities of institutions can have positive impact on the structural social capital and thus in turn affect the recovery trajectories.

Strong and robust institutional capacities help reduce the risk of hazard events by facilitating efficient disaster recovery process. Institutional characteristics such as efficiency, flexible policies, and professional interactions are important for the creation of social capital (Newton 1999; Castiglione et al 2008). The capabilities of institutions can affect the overall performance of structural social capital (Nahapiet and Ghosal 1998; Woolcock 1998; Mohan and Mohan 2002).

Capabilities assessment of social institutions is context specific, and the variables of capability may depend on the institutional domains and field of research. This research particularly focuses on the capabilities of social institutions pertinent to disaster response

and recovery. Drawing from literature, capacity or capabilities of institutions can be defined as the ability of institutions to manage and exchange resources (human and financial), work with mutual co-operation during the emergency response and recovery process, create disaster awareness programs, and implement adaptive and flexible policies for community development (Pelling1999; Ingraham, Joyce et al. 2003; Butterfoss 2006; Andrew and Boyne 2010; Brody et al. 2010; Skelcher et al. 2011; Ting 2011). For this study capabilities of social institutions have been divided broadly into three dimensions based upon social science literature: capacity in terms of collaboration, capacity in terms of management, and capacity in terms of knowledge and awareness. For each dimension, 3-4 variables are selected to get the in-depth and context specific analysis. Capabilities assessment of institutions in terms of management skills, collaborative planning, and knowledge and educational programs are critical to understand as each dimension has its own impact on disaster response and recovery planning. Capabilities of social institutions play a crucial role for the implementation of hazards mitigation and disaster recovery planning to enhance community resilience.

Literature suggests that collaborative efforts among and between various institutions are important to create a well-integrated disaster recovery policy and planning as well as implementation of policies for the efficient recovery process (Nagawaka and Shaw 2004; Frazier et al. 2013; Aldrich et al. 2018). Collaboration of social institutions can include sharing and exchange of resources, joint project management, supporting shared decision making, optimizing the institutions' scarce resources, and joint projects (Dynes 2005). Specifically, a formalized well-documented collaborative plan for non-governmental institutions to work with mutual co-operation along with other agencies can help to promote

exchange of information and resources, expedite the assistance during hazard events without duplicating the work, and create mutual trust with repeated interactions (Ingraham, Joyce et al. 2003; Scholz et al. 2008; Aldrich 2011; Berke at al. 2014). A formalized collaborative plan can also help to shorten the length of joint projects by bringing together groups of government entities and non-governmental agencies. Implementation of plans and polices in a timely manner is important for the improvement of efficiency of institutions.

The management dimension of capabilities of institutions focuses on the development of overall infrastructure of institutions as well as utilizing institutional resources for efficient and positive outcomes (Fredericksen and London 2000; Ingraham, Joyce et al. 2003; Andrews and Boyne 2010; Malik and Blumenfeld 2012). This dimension can include staff availability, resources to deal with hazard events, strong leadership, funds and distribution of funding, and standardized training within institutions (Ingraham, Joyce et al. 2003). Well-resourced (human and financial) institutions in terms of shelter capacity, funds, and staff can better deal with emergency response and hazard events (Colten et al. 2008; Aldrich 2011). Human resources in terms of staff availability are crucial for operationalizing the polices or programs and mobilizing resources during hazard events. Efficient management processes can have positive impact on the overall performance of the social institutions.

The knowledge and awareness dimension of institutions focuses on the creation and practice of educational programs, knowledge transfer and sharing, adapting and implementing local and flexible policies, and knowledge about hazard related issues (Orlikowski 2002; Harvey et al. 2010; Skelcher et al. 2010). Developing and implementing local and flexible policies for disaster recovery and planning are crucial to deal with

unforeseen outcomes from the hazard events. Adaptive and flexible planning can help to reduce the impact of hazard events by acknowledging the environmental uncertainties, people's risk perception, and actual damage and losses that occur in disasters (Brody et al. 2010; Berke et al. 2014). Creating awareness through disaster related educational programs as well as sharing of knowledge among and between agencies is crucial for the recovery process.

The quality and capacity of institutions also depends upon the type of institutions. Typically governmental organizations are more involved in the decision making and planning process as compared to local (non-governmental) social capital rich institutions (Pelling 1999; Colten et al. 2008). Typically, high capacity organizations are big governmental organizations such as EM (Emergency Management) that have enjoyed autonomy in decision making processes, whereas low capacity local organizations are peripheral in decision-making and planning processes (US.GAO 2008). During emergency response periods local non-governmental institutions are crucial for the mobilization of resources. These institutions are usually approached first after a disaster occurs, and at that time, little is known about their capabilities (Brinkerhoff and Brinkerhoff 2002; Aldrich 2011; Ting 2011).

However, literature suggests that non-governmental institutions are the first ones to be approached by the community in case of a disaster event and emergency response (Murphy 2007; Aldrich 2011). A better understanding of non-governmental institutions in terms of their capacity and authority in the decision-making process is crucial for an overall efficient recovery process. Successful recovery and planning processes are thought to be influenced by the capabilities of social institutions which can facilitate the non-structural

mitigation strategies such as social capital (Godschalk et. al. 2003; Berke et al. 2012; FEMA 2018).

A comprehensive understanding of the capabilities of both governmental and non-governmental institutions will help to better prepare for emergency response and recovery. Although previous studies have evaluated the role of structural social capital in disaster recovery processes, little is known about how capabilities of social institutions can actually affect the association between structural social capital and disaster recovery. This study identifies the role of the capacity of social institutions in disaster recovery and planning processes, and this chapter argues that structural social capital of institutions is positively associated with the capabilities of institutions.

## 4.3 Data and Methods

The research described in this chapter addresses the fifth research question by the opportunities and constraints of structural social capital for an efficient disaster response and recovery.

### 4.3.1 Survey Instrument

 A survey instrument was developed to evaluate, from the standpoint of agents involved in the recovery process, the capabilities of structural social capital and the role of non-governmental and governmental agencies to facilitate disaster recovery. A copy of the survey used is provided in Appendix B. The survey data were collected after the University of Idaho Institutional Review Board certified this research (IRB#15-840) as exempt in August 2015. The Dillman (1978) method was used to develop this web-based survey to get a better response rate. This web-based survey was distributed in Fall 2015 and Spring 2016 to 100 non-governmental and governmental agencies across the study area. A total of 62

agencies responded to the survey. The list of agencies was provided by the Emergency

Management Office of the study area and also through the Manatee County websites. The

list of agencies came from participants of a DPPC (Disaster Preparedness and Planning

Committee) meeting. The survey is comprised of both open and close ended questions using

a four-point Likert scale rating to evaluate the capabilities of various institutions for disaster

recovery. The survey includes a cover letter and a total 14 questions. Agency representatives

were from local, state, and regional departments, about 40% from state and reginal

organizations and 60% were from local organizations. The questionnaire was developed to

understand the capabilities of social institutions pertinent to disaster recovery process and

based upon the concepts of structural social capital discussed in this chapter. The questions

were designed to understand the perception of agencies as well as factors affecting the

capabilities of social institutions for disaster response and recovery process. This research

uses a quantitative methodology to evaluate and analyze the survey results and response and

utilizes multivariate techniques to analyze agents' perception about community

characteristics and the association between capabilities of social institutions and structural

social capital.

**4.3.2 Statistical strategies and justification**

To address the research question 5, this research utilizes the following statistical

methodologies- principal component analysis, ordinal logistic regression, and cross-

tabulation. Factor analysis is performed to analyze the perception of agencies for

community characteristics, changes due to collaboration, and importance of public

involvement in disaster recovery. Factor analysis is performed using principal component

analysis (PCA), which is a multivariate statistical technique and useful to reduce variables

into a limited number of relevant components and to analyze complex sets of data with multiple variables PCA groups common variables into factors (principal components) based on their relationships, and can be used to reduce variables of community characteristics, changes due to collaboration, and importance of public involvement into smaller inter-correlated variables based on how they related to one another (Dillon and Goldstein 1984; Seber 1984). PCA is commonly used for the wide range of Likert scale data to identify groups of inter-correlated variables in the dataset (Field 2005; Suchy et al. 2010; Bihari and Ryan 2012; Dumitrescu et al. 2013; Tutu et al. 2019. The multicollinearity of the variables can be checked by looking at the determinant of the R-matrix, and it should be greater than 0.00001. Before the extraction of the components, the KMO and Bartlett test was analyzed to examine the data suitability and sample adequacy to run the PCA analysis. The sample adequacy of the data is measured by KMO (Keiser-Meyer-Olkin) and it ranges from 0 to 1, and a value greater than 0.600 shows that the sample size is adequate (Kaiser 1970). The Bartlett test of sphericity is a statistical test to measure overall significance of all correlations within a correlation matrix at $P < 0.001$.). The Bartlett test gives a chi-square output and that needs to be significant (Bartlett 1950). The following criteria were used to determine categories from the variables: Eigenvalues greater than 1.0, Kaiser Criterion to identify significant variables for each component and individual variable with factor loading greater than 0.50 (Ryan 2006). This research applied varimax orthogonal factor rotation which is one of the most popular rotation methods to identify principal components. The varimax rotation rotate factors to maximize the variation of square factors loading of a given factor and associate each variable within a particular factor (Dillon and Goldstein 1984).

The loading of each component was analyzed to interpret the dominant influences on the principal components.

The categories from variables were predefined and based on existing literature to explain the agent's perception about community characteristics, changes due to collaboration, and importance of public involvement. Additionally, to measure internal consistency and degree of fit between the variables within each category in the survey data, the Cronbach alpha was computed and evaluated. The Cronbach coefficient value ranges from 0 to 1. The value greater than 0.7 considered good to measure reliability of the data. It measures the internal consistency of composite scores for the variables that were dominant in the loading for each principal component. (Cronbach 1951).

Furthermore, to understand the association between institutional capabilities and structural social capital, this research utilized the ordinal logistic regression and not the multiple linear regression, because of the categorical nature of the dependent variables (i.e. low, medium, and high) and the independent variables as well. Ordinal regression is designed to analyze ordinal variables which can be categorized (Agresti 2013) for both response (structural social capital) and multiple predictor variables (management capabilities, knowledge capabilities, and collaboration capabilities of social institutions). In social science literature (Long 1997; Anderson 1984; O'Connell 2006) ordinal logistic regression has been considered a sufficient technique to analyze rank-ordered (e.g. Likert scale) variables.

The ordinal logistic regression utilized in this research can be explained through the following equation

$$Logit\ [\pi(x)] = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \ldots.. + \beta_5 X_5$$

Where, $\pi(x) = P(Y=1)$ at values $x = (X_1.........X_5)$ probability at value $x$.

[ Response variable: structural social capital (low, medium, and high)]

$\alpha$ is the constant of the equation

$\beta$ is coefficient of the predictor variables

Independent variables (and categories)

$X_1$ = collaboration capabilities of institutions (low, high)

$X_2$ = management capabilities of institutions (low, high)

$X_3$ = knowledge capabilities of institutions (low, medium, and high)

$X_4$ = types of institutions (reginal, state, local)

$X_5$ = non-traditional/ innovative solutions (low, high)

The logit function in a logistic regression can be defined as the log of the odds ratio

of a set of observations. The logit function computes the log of an odds and is helpful to

analyze nonlinearly categorical predictor variables (Agresti 2013). The logit is $\log\left(\dfrac{\pi}{1-\pi}\right)$

of $\pi$, where $\pi$ is the probability ranging from 0 to 1, and logit can be any real number,

ranging from – to + infinity. The logit function transforms the non-linear and bounded

probability (0 to 1) to an unbounded linear function. The coefficients in the model for the

independent variables represents the log (odds ratio), which indicates how much each

independent variable increases or decreases the odds of the response variable to be within

the given category. The SPSS statistical software package for the ordinal logistic regression

was used. The model utilizes the maximum likelihood method to estimate the unknown

parameters (constant and coefficients) of the variables.  This technique is useful for

nonlinear distribution of data, as compared to ordinary least square estimation, which is

useful for normal distribution of data. The maximum likelihood method maximizes the

probability of getting observed results given the fitted regression coefficient (Brant 1990; Long 1997; O'Connell 2006; Agresti 2013). Ordinal logistic regression outcomes include: parameter estimates, model fitting information (-2 log likelihood, chi-square), goodness-of-fit statistics, three pseudo $R^2$ measures (Cox and Snell, Nagelkerke, and Mc Fadden), and the test of parallel lines (proportional odds). The Wald statistics and p values in parameter estimates provide an index of the significance of each predictor variable in the statistical model. The pseudo R-square values are not similar to the coefficient of determination (R-square) of linear regression. The coefficient of determination explains the proportions of variance in the data, whereas the pseudo R-square indicates the model fitting information, where a high pseudo R-square means the model is good. The model fitting information with p value less than 0.05 shows that model fits the data well and is statistically significant. The goodness-of-fit statistics with non-significant chi-square value, p value greater than 0.05, shows the model is good and well-fitted. The test of parallel lines (proportional odds) with p value greater than 0.05 rejects the null hypotheses and satisfies the assumption of ordinal logistic regression.

Initially, an index was created for both response and predictor variables. The structural social capital index was created by summing the observed scores for all structural social capital variables, and the Cronbach alpha was also computed to test the scale reliability of the index. The sum of the observed score was scaled and coded as low, medium, and high category; scale of 4-6 is defined as low category, scale of 7-9 is defined as medium category, and scale of 10-12 is defined as high category. For, collaboration and management capabilities dimension index was created by summing up the scores and was coded as low, and knowledge capabilities dimension index was coded low, medium, and

high. high. The index creation helps to better represent the data by combining the relevant variables (see figure 4.1, details of variables) for each category. Further, bivariate analysis was conducted to test the statistically significant association between each independent variable and the response variable, and to get the most important independent variables in this research. Bivariate analysis was conducted both for the individual independent variable as well as the index created from these variables. Bivariate analysis helped to determine the relevant independent variables for the analysis. The significance level is tested at p value less than or equal to 0.05. The initial bivariate analysis helps to eliminate the independent variables for further analysis. From the bivariate result the following variables are not significant with dependent variables: strong local leadership and optimizing institutions scarce resources. Subsequently, a Chi-square test is used to assess the problem of multicollinearity, to test the independence of all the predictor variables. Chi-square test determine the association of two categorical predictor variables, by using p value approach at 0.05 cut off value. The following pair of variables were found to be highly collinear: strong local leaderships and trust in local institutions. These variables were not included in creating the indices for the management, collaboration, and knowledge dimensions of capabilities. In the ordinal regression model, one of the categories of variables is selected as reference category, for the response and predictor variables- category "high"- is selected as reference category.

| Predictor variables | Proximate variable | Outcome |
|---|---|---|
| • Collaboration capabilities<br>•Formalized collaborative plan<br>•Sharing of resources<br>•Joint project creation and implemetation<br>• Management capabilities<br>•Staff avaialbility<br>•Well-resourced instUons<br>•Funds<br>•Training<br>• Knowledge capabilities<br>•Adaptive policies<br>•Disaster awareness programs<br>•Knowledge about hazard preparedness | • Structural social capital<br>•Network of agencies<br>•Frequency of participation for planning<br>•Interactions | • Efficient disaster response and recovery |

**Figure 4.1: Framework of Structural Social Capital Assessment**

This research hypothesized that capabilities variables of social institutions positively affect the structural social capital, and higher levels of structural social capital directly increase efficiency of disaster response and recovery. The framework of structural social capital assessment including indicators of response and predictor variables is shown in Figure 4.1.  Based upon literature and framework, structural social capital variables included are: social networks of agencies for exchange of information and resources, professional interaction among and between agencies, and rate of participation for community planning and recovery. The questions were asked on a Likert scale ranging from 1 to 4 rating scale.

The capabilities of social institutions are measured as independent variables and based upon literature, broadly divided into three dimensions: collaboration capabilities, management capabilities, and knowledge capabilities. The variables included for

collaboration capabilities are: formalized plan to work with collaboration, sharing of resources among agencies, and joint project. The variables for management capabilities are: staff availability for governmental and non-governmental institutions, how well they are resourced to deal with emergency response and recovery, availability of funds, and standardized training of non-governmental institutions. Knowledge capabilities variables include: disaster awareness programs and education, knowledge about hazard preparedness, and adaptive and flexible policies for the recovery process. This research controlled for types of institutions and was divided into three categories: state, regional, and local, and those utilizing non-traditional solutions for the recovery process. The non-traditional solutions were further coded as dichotomous low and high categories.

Further, to analyze the association between structural social capital and variables of each dimension of capabilities of institutions (knowledge, collaboration, and management) cross-tabulation was performed. Cross-tabulation demonstrates the relation patterns though frequency counts and associated percentages. The cross-tabulation is a rectangular table having categories of X (response variable) in I rows and categories of Y (predictor variables) in J columns, and the cells of the table represent the possible outcomes of IJ (rows and columns) (Dillon and Goldstein 1984). This research utilizes the cross-tabulation to determine the relationship between each variables of capabilities of institutions (Y variable) and structural social capital (X variable). The association between X and Y variables are considered significant when p value of Pearson chi-square and likelihood ratio are less than 0.05.

**4.4 Results**

The first three subsections describe the results of the PCA done on the survey results, and the last subsection describes the output of the ordinal logistic regression. In the presentation of the loading factors for each of the principal components, the variables are grouped in accordance within the framework of structural social capital, which was based on the literature. This was done in order to facilitate the use of the PCA output as one way to evaluate the construct validity for the framework.

**4.4.1. Agents' perception of their community social structure**

To understand the agents' perceptions about community social structure, agents were asked questions related to social characteristics and attributes that made their community unique. Participants ranked variables of community social structure on a four-point Likert scale (1=not much, 2=a little bit, 3=quite a bit, 4=very much). In table 4.1, 0.703 value of KMO, and 0.00 P value of Bartlett test shows the sample size is adequate and suitable for the PCA analysis. PCA was performed in total 12 variables of community social structure for all 62 agents responses and results indicate that the first component, which represents 33.43% of the variance, is comprised of six variables that relates to social network and collective action category. The second component represents 18.03% of variance and includes three variables that relates to community participation and collaboration. The third component represents 12.23% of the variance and includes three variables that relates to community cohesion/diversity. Further, to check data reliability and internal consistency of the variables in all three components as well as for al 12 variables together, results of Cronbach's alpha value of 0.735 illustrate a strong internal consistency and data reliability for all 12 variables. And, for each component- Cronbach alpha of the first component is

0.794, the second component is 0.825, and the third component is 0.733, the value shows good data reliability. All the variables of community social structure are grouped into three inter-correlated components: social network and collective action category, community participation and planning category, and community cohesion/diversity category While there is a slight difference in the mean value of all the variables included in these categories, they demonstrate various aspects of community social structure.

**Table 4.1: PCA Assessment Test**

| KMO and Bartlett's Test | | |
| --- | --- | --- |
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | 0.703 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 301.955 |
| | df | 66 |
| | Sig. | 0.000 |

In table 4.2, all loading factors above 0.5 are shown for each of the three-principal component. The values shown in the rightmost column are the mean values for the Likert scale survey responses for those variables. Variables in the community participation and collaborative planning category were dominate for component 2 and formed a high rated category with mean value 3.11 in the survey results. The variables included in this category are: proactive approach to hazards management, knowledge about hazard preparedness, and preparedness to mobilize resources during emergency. The individual variable that ranked the highest was well-prepared to mobilize resources during emergency (mean=3.18). The other two variables (proactive approach to hazards management and knowledge about hazards preparedness) have same mean value (3.11). The community cohesion or diversity category was loaded in component 3 and ranked as second category with mean 2.88. Diverse community groups ranked as the highest rated item (mean = 3.11), followed by high percentage of low socio-economic populations (mean =2.77), and many migrants/non-home owner (mean 2.77).

**Table 4.2: Agents' Perception of Community Social Structure**

| Factors | Eigen value | Factor Loading * (% Variance) | | | Mean Survey Response |
|---|---|---|---|---|---|
| | | Component 1 (33.43%) | Component 2 (18.93%) | Component 3 (12.23%) | |
| **Social network and collective action** | **4.012** | | | | **2.62** |
| strong social network | | 0.861 | | | 2.64 |
| trust in local agencies | | 0.725 | | | 2.82 |
| strong local leadership | | 0.656 | | | 2.82 |
| special assistance for marginalized pop | | 0.650 | | | 2.66 |
| close knit community | | 0.617 | | | 2.23 |
| local residents are involved in local groups | | 0.519 | | | 2.57 |
| **community participation and collaboration** | 2.165 | | | | **3.13** |
| proactive approach to hazards management | | | 0.867 | | 3.11 |
| knowledge about hazards preparedness/planning | | | 0.830 | | 3.11 |
| mobilization of resources during hazard events | | | 0.795 | | 3.18 |
| **community cohesion/diversity** | **1.469** | | | | **2.88** |
| many migrants/non-home owners | | | | 0.907 | 2.77 |
| high percentage of low socio-economic populations | | | | 0.785 | 2.77 |
| diverse community groups | | | | 0.660 | 3.11 |

(* Factor values not shown were all less than 0.5, Total variance explained: 63.70%)

Social network and collective action items were loaded in component 1 and formed a low-rated category with mean 2.62. Items within this category that ranked highest were trust in local agencies and strong local leadership with mean value 2.82. The individual variable that ranked the lowest was close knit community (mean 2.23), followed by residents involved in local groups (mean 2.57). These results indicate that agents perceive their community as diverse with strong local leaders and that they have a high level of trust in local agencies. However, the agents also perceive there is low level of involvement of residents in local groups, and there is limited assistance for marginalized populations.

**4.4.2. Agents' view on changes in the community due to collaborative efforts**

To understand the role and importance of collaboration over the past few years, agents were asked how much change happened due to collaborative efforts. The items included are: optimization of scarce resources, sharing of resources within institutions, understanding community needs, interactions among and between agencies. Agents ranked the changes they had observed due to collaborative efforts over the past few years on a four-point Likert scale (1=not much, 2=a little bit, 3=quite a bit, 4=very much). In table 4.3, 0.793 value of KMO, and 0.00 P value of Bartlett test shows the sample size is adequate and suitable for the PCA analysis.  PCA results indicate that all of seven variables of changes due to collaborative efforts are loaded into   one component with total 61.29% of the variance. Further, the Cronbach alpha value of 0.838 for all seven variables in one component indicate the good reliability of data.

**Table 4.3: PCA Assessment Test**

| KMO and Bartlett's Test | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | 0.793 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 245.720 |
| | df | 21 |
| | Sig. | 0.000 |

In Table 4.4, all loading factors are shown for the one principal component. The values shown in the rightmost column are the mean values for the Likert scale survey responses for those variables. Overall, agents perceived that there have not been high significant changes in the aspects of collaboration for all the listed items with mean value of 2.62. Results showed that the variables rated the highest are professional interactions with other agencies, followed by ability to share resources with other institutions/projects, with mean values 3.00 and 2.82. The lowest rated are access to resources for disadvantages populations, and mobilization of resources between varied citizens, with mean values 2.34 and 2.40. This indicates that even though there has been a positive change due to collaborative efforts in terms of interactions and sharing of resources, still there is little understanding of community specific needs as well as access to resources for marginalized populations.

**Table 4.4: Agents' Perception on Collaborative Efforts**

| Factor | Eigenvalue | Factor Loading (% Variance) Component (61.29%) | Mean Survey Response |
|---|---|---|---|
| **Changes due to collaborative efforts** | **4.29** | | **2.63** |
| Professional interactions with other agencies | | 0.848 | 3.00 |
| Ability to share resources with other institutions/projects | | 0.660 | 2.82 |
| Understanding of community needs | | 0.852 | 2.81 |
| Time period needed to plan/or implement projects | | 0.796 | 2.52 |
| Mobilization of resources between varied citizens | | 0.746 | 2.40 |
| Optimizing the community's or organization's scare resources | | 0.794 | 2.52 |
| Access to resources for disadvantages populations | | 0.768 | 2.34 |

### 4.4.3. Agents' view on public involvement process for hazards recovery

Agents were asked to rate the public involvement process for hazard mitigation and recovery planning that covers the various aspects of public participation process for the community good. Respondents ranked the variables of the public involvement process on a four-point Likert scale (1=not much, 2=a little bit, 3=quite a bit, 4=very much). In table 4.5, 0.900 value of KMO, and 0.00 P value of Bartlett test shows the sample size is adequate and suitable for the PCA analysis. PCA results indicate that all 10 variables of public involvement process for hazards recovery are loaded into one component with total 71% of

variance. Further, the Cronbach alpha value of 0.840 of all 10 variables loaded into one component indicates that data reliability is good.

**Table 4.5: PCA Assessment Test**

| KMO and Bartlett's Test | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | 0.900 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 580.527 |
| | df | 45 |
| | Sig. | 0.000 |

**Table 4.6: Agents' Perception of Public Involvement**

| Factor | Eigenvalue | Factor Loading (% Variance) Component (71%) | Mean Survey Response |
|---|---|---|---|
| **Public Involvement** | **7.115** | | **3.00** |
| Utilizes indigenous knowledge | | 0.811 | 3.00 |
| Improves relations between agencies and citizen | | 0.889 | 3.18 |
| Allows input from citizens | | 0.829 | 3.11 |
| Influences management outcomes | | 0.850 | 2.85 |
| Consider place specific community needs | | 0.892 | 3.02 |
| Consider better representation of marginalized populations | | 0.841 | 2.97 |
| Consider more public involvement in decision making process | | 0.753 | 2.74 |
| Creates disaster awareness and educate them | | 0.865 | 3.19 |
| Encourages non-traditional/new solutions | | 0.854 | 2.95 |
| Promotes social networks among and between communities | | 0.842 | 2.89 |

In Table 4.6, all loading factors are shown for the principal component. The values shown in the rightmost column are the mean values for the Likert scale survey responses for those variables. Overall, agents attributed high importance to the public involvement process for hazards mitigation and disaster recovery, with mean value of 3.00. The highest ranked individual variable was creating disaster awareness and educating the public, followed by improves relations between agencies and citizens. The lowest ranked variable was more public involvement in decision making process (mean 2.94), followed by influences management outcomes (mean 3.06) and promotes social networks among and between communities (mean 3.17). Results indicated that importance was given to create disaster awareness and educational programs. Public involvement in the decision-making process was given the least priority. This could be related to less involvement of residents in local groups.

### 4.4.4. Multivariate analysis of structural social capital

As discussed, capacity of social institutions is important for the formation of structural social capital. To understand the association between structural social capital and capabilities of social institutions, an ordinal logistic regression was performed This research utilized ordinal logistic regression and not discriminant analysis because the independent variables are at the ordinal scale not at the interval scale. The structural social capital is considered as a dependent variable, whereas capabilities of social institutions are considered as predicator variable. Two statistical models were performed for the logistic regression, Table 4.7 and 4.8 shows the description of variables used in Model 1, and Model 2, including categories, sample size (N), and marginal percentages. This research controlled for types of social institutions and utilizing non-traditional solutions for disaster recovery. It

assumes that local (non-governmental) institutions can help to facilitate the recovery process as these institutions are approached first by the citizens. This research also assumes that incorporating non-traditional solutions and innovative ideas can help improve the capabilities of institutions and create an efficient recovery process.

**Table 4.7: Description of Variables used in Model 1**

| Description of variables used in Model 1 | | | |
|---|---|---|---|
| Variables | Categories | N | Marginal Percentage |
| Structural social capital | low | 10 | 16.7% |
| | medium | 24 | 40.0% |
| | high | 26 | 43.3% |
| Collaboration capabilities of institutions | low | 34 | 56.7% |
| | high | 26 | 43.3% |
| Management capabilities of institutions | low | 29 | 48.3% |
| | high | 31 | 51.7% |
| Knowledge capabilities of institutions | low | 7 | 11.7% |
| | medium | 24 | 40.0% |
| | high | 29 | 48.3% |

**Table 4.8: Description of Variables used in Model 2**

| Variables | Categories | N | Marginal Percentage |
|---|---|---|---|
| Structural social capital | low | 10 | 16.7% |
| | medium | 24 | 40.0% |
| | high | 26 | 43.3% |
| Collaboration capabilities of institutions | low | 34 | 56.7% |
| | high | 26 | 43.3% |
| Management capabilities of institutions | low | 29 | 48.3% |
| | high | 31 | 51.7% |
| Knowledge capabilities of institutions | low | 7 | 11.7% |
| | medium | 24 | 40.0% |
| | high | 29 | 48.3% |
| Types of institutions | regional | 9 | 15.0% |
| | state | 15 | 25.0% |
| | local | 36 | 60.0% |
| Non-traditional/innovative solutions | low | 15 | 25.0% |
| | high | 45 | 75.0% |

**Table 4.9: Modeling Structural Social Capital (Model 1)**

| | Variable Categories | Estimate | Std. Error | Wald | df | P-Value | 95% Confidence Interval | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Lower Bound | Upper Bound |
| Dependent variable | **Structural social capital** | | | | | | | |
| | [Low] | -4.703 | 0.872 | 29.090 | 1 | 0.000 | -6.412 | -2.994 |
| | [Medium] | -1.776 | 0.592 | 9.004 | 1 | 0.003 | -2.936 | -0.616 |
| | [High*] | | | | | | | |
| Independent variables | **Collaboration capabilities** | | | | | | | |
| | [Low] | -1.466 | 0.597 | 6.026 | 1 | 0.014 | -2.636 | -0.295 |
| | [High*] | 0[a] | | | 0 | | | |
| | **Management capabilities** | | | | | | | |
| | [Low] | -1.086 | 0.576 | 3.549 | 1 | 0.050 | -2.215 | 0.044 |
| | [High*] | 0[a] | | | 0 | | | |
| | **Knowledge capabilities** | | | | | | | |
| | [Low] | -3.635 | 1.119 | 10.557 | 1 | 0.001 | -5.828 | -1.443 |
| | [Medium] | -1.324 | 0.606 | 4.776 | 1 | 0.029 | -2.511 | -0.137 |
| | [High*] | 0[a] | | | 0 | | | |

$R^2$ = Cox and Snell = 0.423, Nagelkerke = 0.485, Mc Fadden = 0.267, *Reference Category

In model 1 (see Table 4.9), all three dimensions of capabilities (collaboration, management, knowledge) of social institutions are significant predictors of structural social capital of institutions of the study area. The model fitting information shows that the model is fitted with significant chi-square value (p-value <0.001). The goodness-of-fit test rejects the null hypothesis with p-value >0.05. The test of parallel lines (proportional odds) also rejects the null hypothesis with p-value >0.05 and shows that the model fits the data well. The non-significant p-value (greater than 0.05) shows that the model is good and well-fitted

to the data. The R-square values (Cox and Snell=0.423, Nagelkerke=0.485, Mc Fadden=0.267) show that the model fits the data well. As a categorical variable, negative estimates mean a likelihood of a lower score on the response variable compared to the reference category of the predictor variables.

The parameter estimate of all the variables is negative, indicating that the reference category in terms of high capabilities is more significant for the response variable. The most significant predictor variable of structural social capital is collaboration capabilities of institutions, with p-value <0.05. The estimate of variable is negative low (-1.466). The negative estimate value shows that, in comparison to the reference category (high), the low category of the predictor variable is associated with a lower code value on structural social capital. Therefore, higher capabilities of social institutions can lead to higher structural social capital. The other two predictor variables—management capabilities and knowledge capabilities—are also significant at p-value <0.05. The management capabilities negative estimate value (-1.086) for the low category shows that the higher category of management capabilities is positively associated with structural social capital. Similarly, the estimate values of low (-3.635) and medium (-1.324) categories of knowledge capabilities show negative values and indicate that the higher the knowledge capabilities of institutions, the better the structural social capital.

In model 2 (see, Table 4.10), this research controlled for types of institutions and utilizing non-traditional or innovative solutions for hazards response and recovery. Types of institutions are broadly categorized into regional, state, and local organizations. The other predictor variables—management capabilities, collaboration capabilities, and knowledge capabilities—are same as model 1 (Table 4.9). The model fitting information shows that the

model is well-fitted to the data with p-value <0.001, the values of – 2 log likelihood, and chi square is 61.634 and 38.935. The goodness-of-fit test rejects the null hypotheses with p-value >0.05. The test of parallel lines also rejects the null hypothesis with p-value >0.05 and shows that the model is good and well-fitted.

**Table 4.10: Modeling Structural Social Capital (Model 2)**

| | Variable Categories | Estimate | Std. Error | Wald | df | P-value | 95% Confidence Interval | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Lower Bound | Upper Bound |
| **Dependent variable** | **Structural social capital** | | | | | | | |
| | [Low] | -5.303 | 1.003 | 27.978 | 1 | 0.000 | -7.268 | -3.338 |
| | [Medium] | -2.102 | 0.648 | 10.530 | 1 | 0.001 | -3.372 | -0.833 |
| | [High*] | | | | | | | |
| **Independent variables** | **Collaboration capabilities** | | | | | | | |
| | [Low] | -1.437 | 0.628 | 5.229 | 1 | 0.022 | -2.668 | -0.205 |
| | [High*] | 0ᵃ | | | 0 | | | |
| | **Management capabilities** | | | | | | | |
| | [Low] | -1.268 | 0.617 | 2.997 | 1 | 0.023 | -2.278 | 0.141 |
| | [High*] | 0ᵃ | | | 0 | | | |
| | **Knowledge capabilities** | | | | | | | |
| | [Low] | -3.432 | 1.229 | 7.792 | 1 | 0.005 | -5.841 | -1.022 |
| | [Medium] | -1.262 | 0.634 | 2.806 | 1 | 0.024 | -2.304 | 0.181 |
| | [High*] | 0ᵃ | | | 0 | | | |
| **Controlled variables** | **Types of institutions** | | | | | | | |
| | [Reginal] | -1.565 | 0.873 | 3.210 | 1 | 0.043 | -3.276 | 0.147 |
| | [State] | -0.358 | 0.711 | 0.253 | 1 | 0.615 | -1.751 | 1.035 |
| | [Local*] | 0ᵃ | | | 0 | | | |
| | **Non-traditional solutions** | | | | | | | |
| | [Low] | -1.014 | 0.742 | 1.865 | 1 | 0.172 | -2.469 | 0.441 |
| | [High*] | 0ᵃ | | | 0 | | | |

R2 = Cox and Snell=0.477, Nagelkerke=0.548, Mc Fadden=0.316, *Reference Category

The R Square values also show that the model fits the data well. Result shows that association between management capabilities, collaboration capabilities, and knowledge capabilities, and the response variable (structural social capital) has been same as discussed earlier in Model 1 (Table 4.9). In types of institutions, regional institutions are found significant to the response variable as compared to the state institution. The non-traditional solutions are not found significant for the response variable. Local institutions are ranked as a reference category. The negative estimate value of regional and state institutions indicate that they have lower code values on the response variable, which implies that they have less rating on structural social capital, compared to the local institutions.

**4.5 Discussion**

This research demonstrates that structural social capital is positively associated with the capabilities of social institutions. Structural social capital plays an importance role in disaster response and recovery process. Strong structural social capital enables the development of efficient disaster recovery measures and creates a more resilient community. To understand how structural social capital helps to create efficient disaster recovery process for a community, it is also important to analyze how agents of social institutions perceive their community social structure and the importance of collaborative efforts and public involvement in the recovery programs and planning. The role of structural social capital for recovery measures is thought to be influenced by their capabilities to create and implement an efficient emergency response and recovery process.

Results of statistical modeling indicate that determinants of structural social capital are collaboration capabilities, management capabilities, knowledge capabilities, and types of institutions. Higher capabilities of institutions lead to higher structural social capital to

implement and develop effective recovery measures and polices. This study compares with other works to explain how a comprehensive understanding of capabilities of social institutions can have a positive impact on the incorporation of non-structural measures such as structural social capital in response and recovery (Holing 1996; Uphoff 2000; Brody et al. 2010). This study and other work have found that strong networks and high participation rates of social institutions in response and recovery can be directly impacted by the number of staffs, funds, joint projects, collaborative plans, training, and flexible policies and programs (Brody et al. 2010; Smith et al. 2012).

Statistical modeling shows the association between structural social capital and indices of each capabilities' components. To show the association between structural social capital and each variable of institutional capabilities, this research utilizes a cross-tabulation technique (Table 4.11). The relationship between structural social capital and each capabilities variable shows a similar pattern and indicates that the percentage of values of structural social capital that are "high" increases with increasing value of each capabilities variables.

**Table: 4.11 Cross-Tabulation: Capabilities Variables and Structural Social Capital**

| Capabilities Variables | Categories | Structural Social Capital | | | Total |
|---|---|---|---|---|---|
| | | Low | Medium | High | |
| Formalized collaborative plan | Low | 14.50% | 16.10% | 11.30% | 41.90% |
| | High | 3.20% | 24.20% | 30.60% | 58.10% |
| | Total | 17.70% | 40.30% | 41.90% | 100.00% |
| Sharing of resources | Low | 9.70% | 16.10% | 11.30% | 37.10% |
| | High | 8.10% | 24.20% | 30.60% | 62.90% |
| | Total | 17.70% | 40.30% | 41.90% | 100.00% |
| Joint projects creation and implementation | Low | 12.90% | 24.20% | 14.50% | 51.60% |
| | High | 4.80% | 16.10% | 27.40% | 48.40% |
| | Total | 17.70% | 40.30% | 41.90% | 100.00% |
| Staff availability | Low | 14.50% | 14.50% | 16.10% | 45.20% |
| | High | 3.20% | 25.80% | 25.80% | 54.80% |
| | Total | 17.70% | 40.30% | 41.90% | 100.00% |
| Well-resourced institutions | Low | 14.50% | 17.70% | 6.50% | 38.70% |
| | High | 3.20% | 22.60% | 35.50% | 61.30% |
| | Total | 17.70% | 40.30% | 41.90% | 100.00% |
| Funds | Low | 14.50% | 21.00% | 17.70% | 53.20% |
| | High | 3.20% | 19.40% | 24.20% | 46.80% |
| | Total | 17.70% | 40.30% | 41.90% | 100.00% |
| Training | Low | 14.50% | 19.40% | 9.70% | 43.50% |
| | High | 3.20% | 21.00% | 32.30% | 56.50% |
| | Total | 17.70% | 40.30% | 41.90% | 100.00% |
| Adaptive policies | Low | 16.10% | 11.30% | 6.50% | 33.90% |
| | High | 1.60% | 29.00% | 35.50% | 66.10% |
| | Total | 17.70% | 40.30% | 41.90% | 100.00% |
| Disaster awareness program | Low | 8.10% | 14.50% | 1.60% | 22.60% |
| | High | 9.70% | 25.80% | 40.30% | 77.40% |
| | Total | 17.70% | 40.30% | 41.90% | 100.00% |
| Knowledge about hazard preparedness | Low | 9.70% | 9.70% | 3.20% | 24.20% |
| | High | 8.10% | 30.60% | 38.70% | 75.80% |
| | Total | 17.70% | 40.30% | 41.90% | 100.00% |

Further, results of this study indicate that agents of social institutions considered

their community as being knowledgeable in hazards preparedness and conscious about

collaborative planning efforts. However, agents also perceived that there have not been significant changes due to collaboration efforts, particularly in terms of incorporating and understanding community specific needs and access to resources for marginalized populations. Further, they perceived that the community has high percentage of socio-economic populations and a high number of migrants and non-homeowners. The agents' perception of high percentage of low socio-economic population indicates that the community has more socially vulnerable populations who lack basic amenities to deal with disaster events. Existing literature (Morrow 1999; Cutter and Emrich 2006; Morrow 2008) identified that socially vulnerable populations typically have low social capital in terms of access to resources, and they take longer to recover from a disaster.

The results also indicate that agents perceived that the community has strong local leadership, but the community has low social network for the mobilization of resources and limited assistance to marginalized populations. Agents also assigned high importance to public involvement in hazards planning and recovery, especially to create disaster awareness and educational programs; however public involvement in decision making processes was seen as the lowest priority. Another interesting observation is that improving relations between agencies and citizens is considered as an important element, whereas promotion of social networks among and between communities ranked moderately low. This could be related to less involvement of residents in local groups.

Further, agents' responses from survey results based on open-ended questions indicate that capabilities variables of social institutions are typically in a medium to low category. Results show that components of collaboration capabilities, including a formalized collaborative plan for non-governmental institutions to work with mutual understanding and

without duplicating the work and sharing of resources among and between agencies, have

been considered for the access and mobilization of resources, redevelopment, relocation, and

recovery (US.GAO 2008; Andrews and Boyne 2010; Aldrich 2011). The capabilities of

institutions are not only based on the financial resources, but also on the ability of both

governmental and non-governmental institutions to work with mutual co-operation during

emergency response and recovery periods (Ivey et al. 2002; Brody 2008; Brody et al. 2010).

However, survey results based on agents' responses showed in the quotes below that the

County doesn't have any specific formalized plan for non-governmental institutions to work

with collaboration.

> *Red Cross has fallen way behind after their merger within their Red Cross network of branches regionally. My organization is one of the largest nonprofits in the county, and we have planned internally with a continuity of operations plan. We reached out to the county and Red Cross offering shared use of our facilities for first-responders during a disaster, sheltering displaced families' post-disaster and other opportunities to collaborate* (Agent 17, March 2016).

> *It seems so. But it also seems to be currently a fast turnover of staff at the County-NGO position which is a concern* (Agent 27, March 2016).

> *Have not seen any indication nor heard about the availability of such a plan* (Agent 58, March 2016).

Further, results indicate that components of management capabilities (staff

availability, well-resourced institutions, funds, standardized training of non-governmental

institutions) and knowledge capabilities are important for the development of structural

social capital. Availability of staff at all levels has been considered important for the

development and enforcement of disaster polices and to create efficient management

strategies (Adger et al. 2001; Smith et al. 2012). The agents' response demonstrated in the

quotes below shows that the availability of staff is typically low for all the social

institutions.

*Staff numbers have increased slightly over the past few years but are still lower than what is needed for delivering very timely and highly effective outcomes* (Agent 6, 2016).

*The staff I work with at the county in children's services and neighborhood services are hardworking and carrying a heavy workload. Recent restructuring in department leadership reveals greater efficiency and emerging talent. The nonprofit agencies continue to lack sufficient resources (human resources and financial resources) to adequately address the pace of growth here in Manatee County (Agent 17, 2016).*

*With cuts in governmental staffing during the past recession, many governments did not rehire adequate staffing levels overburdening current staff with additional duties they "inherited" continuing during this upswing in the economy. Many staff members are experiencing "burn out" in their positions due to the workload* (Agent 58, 2016).

*"Since our local Red Cross merged with its other area branches, their local responsiveness to planning has been almost non-existent. The Red Cross leadership has relocated to another county, and the changes to our planning, communications and collaboration have been negatively impacted. The city's leadership (Bradenton) has been focused on internal structural reorganization and has a vacant planning director position, leaving the local needs and planning on the back burner. This is a vulnerability in the short term. Hopefully the city's internal leadership opportunities will be addressed effectively to move our community, especially the low-income, non-English speaking citizens, in a better direction than the last year. I personally experienced a natural disaster and can speak first-hand about the needs for infrastructure, collaboration, planning, communication and leadership. This survey is an encouraging reflection of the county's interest in standards of incorporating leadership from the citizens in our planning. The county's record of welcoming citizen input has been a longstanding example for other area governments to strive toward" (Agent 17, March 2016).*

Further, the survey results based on agents' responses (quoted below) and other work (US.GAO 2008) indicate that in general there is a lack of any nationwide standardized training for non-governmental institutions to work without duplicating assistance. Standardized training of non-governmental institutions can help these institutions to reach out and help disaster victims in a more efficient timely manner (Colten et al. 2008).

*"There is no training that exists as far as I know to help people during emergency response and recovery other than public safety. We are on our own when something happens* (Agent 21, March 2016)".

*"The county emergency management team holds training periodically as well as briefings and discussions of how to meet the county needs. This involves all participating county organizations"* (Agent 50, March 2016).

*"Most complain of lack of time and resources. No incentives for NGO's to take additional training other than what may be mandated* "(Agent 62, March 2016).

The result of this study and literature (US.GAO 2008; Colten et al. 2008) found that resources such as shelter capacity, mass feeding, mobile kitchens, evacuation strategies, and other disaster related resources have a significant positive impact on the immediate response and relief operations during hazard events. The agents' responses in the quotes below indicated that institutions, especially non-governmental institutions, are not well-resourced to deal with emergency response and recovery.

*Governmental groups yes, non-governmental groups...slightly (Agent 3, 2016).*

*We have a wealth of talent in our non-governmental agencies; however, we still lack the capital resources and facilities for adequate response in this growing community (Agent 17, 2016).*

*Preparation for response and recovery on the non-governmental side appears limited (Agent 41, 2016).*

*We have one group--the COAD--that gives this topic air time. Don't think we give the topic enough airtime, nor do we provide enough opportunities for conversation on this topic (Agent 44, 2016).*

*Not sure of non-governmental groups as I have no knowledge of their planning and/or recovery plans (Agent 46, 2016).*

*Not confident that there is adequate equipment and understanding and use of new/alternative social media, mapping, and smart apps (Agent 9, 2016).*

*They are doing the best with the resources and funding available. More funding is required. The County Commission needs to step up (Agent 58, 2016).*

The agents' responses also indicated that the county's funding distribution appears to be limited and fixed and not necessarily based on community needs.

*In many cases, Federal grants and assistance programs appear to be primarily politically driven, rather than need driven (Agent 6, 2016).*

*I see the city and county use HUD funding for general operating expenses including code enforcement, sidewalks and sewer projects year after year. HUD funds need to be used to help build neighborhood services centers to expand the public/private partnerships in serving the needs of our most vulnerable citizens, especially those living in extreme poverty. This proactive leadership is needed in the funding decisions versus reactive Band-aids (Agent 17, 2016).*

*Inadequate personnel resources at County level to process the applications in order to take advantage of available the grant monies* (Agent 61, 2016).

The agents' response for the adaptive and flexible policies indicted in the quotes below that the county's policies are not flexible and based on community needs.

*As an NGO, our immediate concern is Hurricanes, recent Tornadic activity though has forced us to relook at our response plans. I can only comment on our organization (Agent 27, 2016)*

*I'm concerned with the county commission's history of following the county administrator's lead in charting the course for our county. No matter who the county administrator is, we need the collaborative leadership of our elected officials with the involvement of our citizens in order the make the best decisions. Relying on one individual solely for these major decisions affecting our county limits our capability (Agent 17, 2016).*

The survey results of agents' responses in quotes below show that co-ordination between governmental and non-governmental institutions is relatively low with weak networks among diverse institutions, and less participation rate for the disaster recovery polices and planning.

*Disaster recovery is not part of our mission statement. Consequently, the topic gets very little of our time (Agent 44, 2016).*

*We have never been asked by the County in the 3 years here at the Fire Department (Agent 33, 2016).*

*No active solicitation of input from my organization. We have to search for meetings that might be important for us to have a say in (Agent 59, 2016).*

*Could make better use of web and email to make the process more transparent and provide for better exchange of ideas (Agent 61, 2016).*

*Difficult to coordinate a "re-entry" plan being split between two counties. Each county has their own process and our residents are impacted because of this (Agent 6, 2016).*

*The public has contacted us many times to learn about disaster preparedness and when we tell them to call Emergency Management, they say that they have, and no one has ever returned their calls or emails (Agent 5, 2016).*

*County agencies are doing the best with the resources and budget they are given*

*(Agent 3, 2016).*

*For large events, not everyone will be happy. Many will expect more in government handouts. Recovery involves many phases and could extend for years. People expect immediate deliverables in which it usually cannot happen 9Agent 1, 2016).*

Statistical analysis of results shows that capabilities of social institutions in terms of collaborative formalized plans and standardized training are essential for the development of structural social capital. This study and another works (US.GAO 2008) show that non-governmental organizations are typically low in resources, have limited availability of funds and staffs, and are marginalized in decision making process. Formalized collaborative plans and standardized training to work with cooperation and without duplicating efforts, especially during hazard events, have not been found an important part of social institution capability and development.

Further, Figure 4.2 represents both dependent and independent variables affecting capabilities of structural social capital. It indicates that variables such as funds, staff availability, network of agencies, and standardized training are really not very present in social institutions. Most of the variables fall under the category of a low to medium category, only a couple of variables fall under the high category
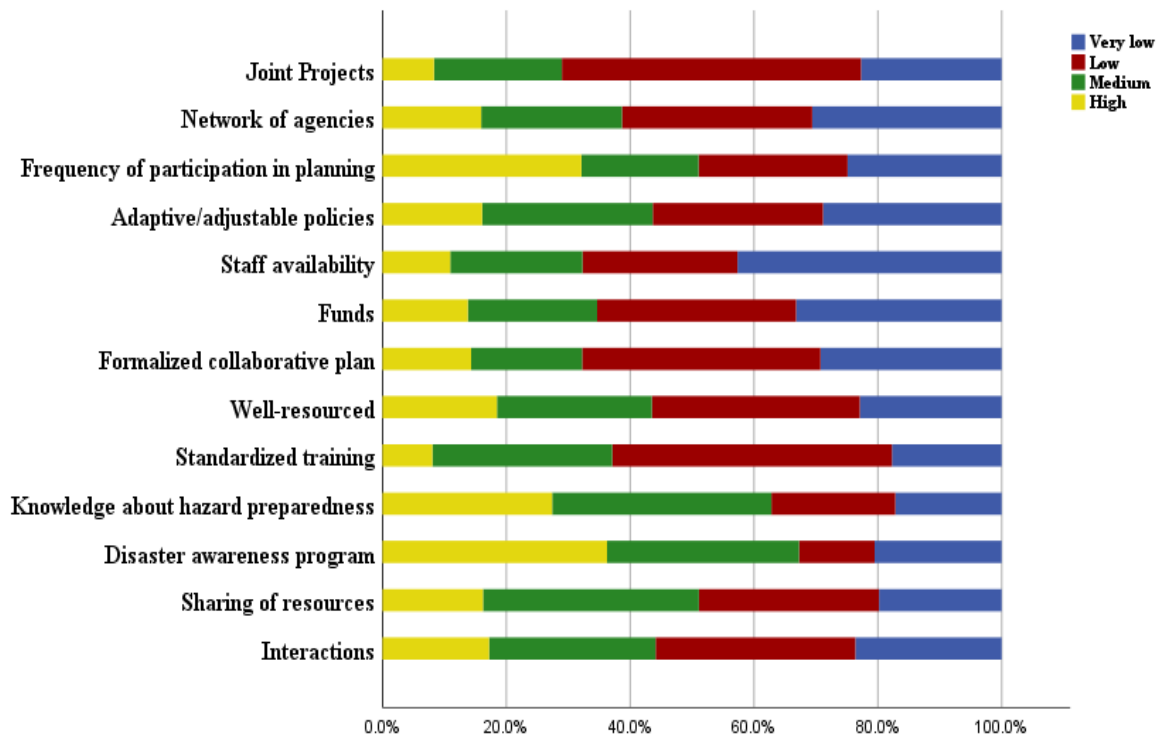
**Figure 4.2: Capabilities of Structural Social Capital**

Given the importance of collaborative, management, and knowledge dimensions of capabilities of institutions, developing capable institutions must be considered as an important step to protect communities from hazard events. The state and regional institutions also need to incorporate local non-governmental organizations by facilitating strong collaborative efforts for exchange of resources and information and two-way communications to work in a more efficient manner for community good. National Response Framework, developed by Department of Homeland Security (DHS) (2008), found that it is critical to better incorporate voluntary non-governmental institutions into Emergency Management systems and to analyze efforts and capabilities of these institutions, especially for large-scale disasters (US.GAO 2008, DHS 2008).

**4.6 Conclusions**

This research demonstrates that a better understanding of structural social capital is important to facilitate the disaster recovery period. For an efficient recovery process and to enhance community resilience, it is crucial to have strong and robust social institutions. However, little work has been undertaken to understand factors that influence the capabilities of social institutions and how they can affect disaster recovery and community resilience. This study identifies the role of the capacity of social institutions in disaster recovery and planning processes and argues that structural social capital of institutions is positively associated with the capabilities of institutions. A comprehensive understanding of the capabilities of both governmental and non-governmental institutions will help them to better prepare for emergency response and recovery.

## Chapter 5: Conclusions: Relevance, Limitations, and future research

### 5.1 Summary

The overall goals of this research were to; a) develop a conceptual framework of social capital and apply it to the b) evaluation of an existing hazards plan, c) model social network of recovery stakeholders, and d) analyze the dynamics of structural social capital. The findings of this research demonstrate that there is need to address the role of social capital in disaster recovery process by evaluating existing hazards plans in that context, analyzing the social network of recovery stakeholders, and examining the capabilities of social institutions involved in the recovery process. The research had a more specific goal to evaluate the role of social capital to facilitate the disaster recovery process in Manatee County, Florida. The research addresses these goals by building a theoretical framework of social capital to evaluate interdependence of agencies and social structure for recovery and planning.

More specifically, the dissertation reached the goals by answering five research questions:

1. What is the role of social capital in the hazards planning and disaster recovery process?

To answer this question, the research described in Chapter 2 utilized NVivo Pro 11 software-based content analysis of hazards plan included Post Disaster Redevelopment Plan, Local Mitigation Strategies, and Comprehensive plan of Manatee County, Florida. The findings indicate that the hazards plan of Manatee County are more focused on fact-based elements and structural recovery process, with a limited incorporation of non-structural strategies such as social capital. Findings indicate that planning documents fail to add detailed sections on understanding community resources and capacity, ways to establish social

relations (trust, reciprocity, social ties) that facilitates to mobilization of resources, formalized plans for social organizations, identification of networks among various agencies, and other social capital measures. The results of surveys and semi-structured interviews with stakeholders indicate that marginal understanding of social capital of officials and institutions often leads to limited incorporation of social capital into planning and disaster recovery process. The survey results also indicate that there is a heavy reliance on social organizations especially after the disaster event occurs, but there is little understanding of the capabilities of those social organizations and therefore, if that reliance is realistic.

2. Based on structuration theory, is it possible to develop a comprehensive social capital framework to better understand the interdependence of social structure and human agencies for the enhancement of community resilience?

This question is addressed in Chapter 1 by developing a conceptual framework of social capital and further the framework was employed in subsequent chapters. Based on literature, Chapter 1 explained how the concept of social capital can be situated in the realm of structuration theory. This research defines social capital as a dynamic resource which exist within the social structure of agencies and can be used and mobilized by them. This conceptual framework of social capital can help to identify the role of agents' in the recovery planning and decision-making process as well as understand the social structure that can constrain or enable their contributions in the recovery process and community resilience enhancement.

3. How can the inclusion of social networks into disaster response and recovery strategies facilitate disaster response and recovery?

4. How can the inclusion of multiple stakeholders from both governmental and non-governmental institutions into the decision-making process lead to a more efficient recovery process?

Chapter 3 answers these two questions through social network modeling based on questionnaire survey of recovery stakeholders. The findings of this research indicate that a better understanding of structure and position of recovery stakeholders can be useful to facilitate communications, share knowledge, resources, and experiences which can ultimately help to create an efficient recovery process. The findings indicate the recovery stakeholders of Manatee County follows a more centralized and hierarchical network pattern and that strong communication ties exist between governmental stakeholders, whereas weak communication ties exist between non-governmental stakeholders for developing recovery policies. The findings from the network modeling in this research also show that the core network for recovery and planning is primarily comprised of Emergency Management Officials, County Planning Officials, and the United Way with local social capital rich institutions being peripheral in the recovery planning and decision-making process. This chapter illustrates: a) the need for decentralized and non-linear network structure and b) that the involvement of multiple stakeholders can lead to a more informed and need-based recovery polices for the Manatee County.

5. What are opportunities and constraints for incorporating structural social capital into short and long-term disaster recovery process?

The research described in Chapter 4 addresses this question by highlighting survey responses that speak directly to this question, as well as statistical analysis of agents' responses using the principal component analysis, and ordinal logistic regression analysis.

The results of statistical modeling indicate that determinants of structural social capital are collaboration capabilities, management capabilities, knowledge capabilities, and types of institutions. Findings of this research demonstrates that the higher capabilities of institutions can lead to higher structural social capital to implement and develop effective recovery measure and policies. Additionally, the results also indicate that the capabilities of social institutions of Manatee County are low for factors such as funds, staff availability, network of agencies, formalized collaborative planning, and standardized training of non-governmental institutions. Similarly, agents' responses also match up with the statistical analysis, and they stated that the social institutions of this County are low in staffs and funds availability, low in resources especially non-governmental institutions, and weak in co-ordination between governmental and non-governmental institutions. These issues question whether current social institutions of Manatee County can provide sufficient resources and assistance during a hazard event.

**5.2 Significance of research**

This dissertation was the first to apply the structuration theory to analyze the conceptual framework of social capital for a case study, with respect to the literature sources identifiable to the researcher. This dissertation demonstrated the value of structuration theory to better understand the interdependence of social structure and human agencies that can increase or attenuate the disaster recovery process and community resilience from extreme natural events.

This research is one of the first to evaluate the presence or absence of social capital in existing hazards plans, such as ones for Manatee County. This type of evaluation will provide planners and emergency managers with knowledge about the significance of social

capital as resources for recovery and planning. This research is also one of the first to analyze the association between structural social capital and capabilities of institutions for disaster preparedness and recovery. The capabilities assessment can help to assess the factors that strengthen or weaken the social institutions contributing to disaster recovery trajectories.

The social network modeling developed in this research helps to understand the structure and position of multiple stakeholders who are involved in the recovery process. The blockmodeling helps to understand the communication patterns of multiple stakeholders in the Manatee County. This information can help to identify the role (core and periphery) and involvement of stakeholders in the decision-making process. This information is important as it helps to understand the network of stakeholders involved in decision making process and also encourages more involvement of peripheral stakeholders to bring their diverse skills, resources, knowledge, experiences, and information related to their organizations. Enhancement of social capital to facilitate the recovery process needs efficient communications and cooperation of multiple stakeholders. The methodology and conceptual framework developed in this research could enable stakeholders, policy makers, and agency personnel to improve and expand the use of social capital information for hazards plan, encourage and facilitate the creation of more robust social institutions, and develop a well-integrated social network for disaster recovery and hazard events.

## 5.3 Limitations of study

Despite the benefits that the conceptual framework and techniques developed in this research can provide, the study has several limitations. Social capital is a multidisciplinary concept and one of the most significant challenges for this research is to build a comprehensive

social capital framework based on existing literature. The theoretical framework of social capital assessment (see Figure 1.2) developed in this research to address the research questions has following limitations – 1) the framework is developed on the basis of structuration theory to analysis the interdependence of social structure and human agencies, however the units of analysis is only restricted to the agencies of institutions, and not the entire community  2) social capital framework has limitations by not incorporating the way to analyze community social structure 3) the framework is not holistic in nature as it is based on a single-theory and limited to incorporate various relevant components of social capital.  Further, he conceptual framework developed in this research is particularly applicable to the hazards field and may not necessarily applicable to the other fields. The findings of the research are limited because the analysis is based on a single county case study as the data source. Coding the planning documents for social capital indicators is also challenging because an overwhelming number of references of the social capital indicators within the data either just referred to the social capital indicators without further explanation or did not refer to any form of social capital. Further, indicators of social capital are highly interrelated and are difficult to evaluate in isolation.

Quantifying social capital has also limitations because some elements of social capital are tangible and easy to analyze such as social network and the role of social organizations. Whereas, some elements are intangible and hard to analyze, such as level of trust, reciprocal actions, and shared values and experiences. Another significant constraint is the limited number of stakeholders for the interview (n=8). This limited sample size may not represent some aspects of the broader perspective on the role of social capital in recovery process and

planning. The options to select controlled variables is also limited in the ordinal logistic regression modeling due to the nature of dataset and survey results.

In the social network modeling, especially blockmodeling, several limitations exist in the methodology. One of the limitations is the identification of the network data structure of recovery stakeholders based on small sample size (n=18), thereby weakening the conclusion from incomplete network information. Additionally, the researcher only analyzed the binary network data and not the valued network data, that may inaccurately represent the structure and position of the network data. The CONCOR technique used to partition the dataset also has limitations to deal with missing data, defining boundaries, and detect weak ties; these factors may contribute to the misrepresent of the network data structure.

**5.4 Future research**

This dissertation provides considerable opportunities for future research needed to address many of the limitations discussed in the previous section. Future research could analyze the conceptual framework of social capital from a more holistic perspective, especially considering the scale of analysis. Further, future research could also analyze the spatial variations of social capital. Specifically, if appropriate data sets could be gathered or generated, future work could also incorporate work of David Harvey "The Condition of Postmodernity" (1990) to examine the spatial variations of structuration in the context of social capital. More advanced blockmodeling such as statistical or stochastic blockmodel could improve the results of future studies employing the theoretical framework applied in this research. Stochastic blockmodeling and a large sample size of network data could help to provide more accurate analysis of the structure and position of stakeholders.

Stakeholder interviews and surveys were critical to this study, thus demonstrating the importance of incorporating local expertise in future research and take advantage of this resource. Future work also needs to incorporate a more comprehensive analysis and coding of planning documents and should incorporate a larger sample size to ensure researchers are supplying information to practitioners in a manner to assist in the complex decision-making required to result in enhancement of community resilience.

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# Appendix A: Chapter 2 Interview Questionnaire

**Interview questionnaire:**

**Social capital**: social capital describes how people interact with each other as well as the effects of those interactions or relationships. Social capital is a resource that facilitates collective action for mutual benefit.
**Hazards**: natural hazards explain the negative consequences of natural phenomena and constitutes threat to society.
**Mitigation:** are comprised of pre-disaster measures and includes both structural and non-structural measure to reduce societal loss and damages from hazard events.

What is the biggest resource constraint you face when a disaster event occurs?

What is the existing role/reliance on social capital for non-structural mitigation strategies in Hazard Mitigation Plans?

Do you think the existing reliance on social capital is sufficient to help respond and recover to major disaster events?

What are the constraints to incorporate social capital into non-structural mitigation strategies and how can these constraints be changed?

What is the existing role of social services such as Non-Governmental Organizations, religious organizations and other community-based organizations in planning process?

# Appendix B: Chapter 4 Survey Instrument and List of Recipients

The purpose of the survey is to provide a holistic assessment of the capabilities of various governmental and non-governmental organizations for disaster response and recovery. A capabilities assessment that combines both governmental and non-governmental organizations will help to improve our understanding of the opportunities and constraints of institutional social capital for disaster response and recovery. This questionnaire will also allow us to better identify strengths in our current capabilities and help us target areas where improvement may be desired.

We would like you to complete the survey about your individual and community's capabilities to reduce natural hazards and disasters. Your responses will be kept completely confidential and released only as a summary. There are no right or wrong answers to these questions. The questionnaire is based on a Likert scale, which allows you to select more than one option. All opinions are valuable whether or not you have experience with natural hazards.

Thank you for your time and assistance.

Aparna Kumari
PhD student
University of Idaho

**How much do you think the following describes your community?**

Scale: 1= not very, 2= a little bit, 3= quite a bit, 4= very much

1 2 3 4     diverse community groups

1 2 3 4     close knit community/strong social ties

1 2 3 4     strong local leadership

1 2 3 4     well- prepared to mobilize resources during emergency

1 2 3 4     knowledge about hazard preparedness

1 2 3 4     proactive approach to hazard management

1 2 3 4     local residents are involved in local groups/ strong social networks

1 2 3 4     special assistance for marginalized populations during emergency

1 2 3 4     trust in local agencies (local and county)

1 2 3 4     many migrants/tourists/ non home owners

1 2 3 4     high percentage of low socio-economic populations

**Within the past few years, your role as community leader/planner/government officials, how much have you seen the following changes due to collaboration?**

Scale: 1= less, 2= about the same, 3= more, 4= much more

1 2 3 4     professional interactions with other agencies

1 2 3 4     ability to share resources with other institutions/projects

1 2 3 4     understanding of community needs/attitudes

1 2 3 4     joint project creation and  implementation of  projects

1 2 3 4     mobilization of resources between varied citizens

1 2 3 4     optimizing the community's or organization's scarce resources

1 2 3 4     access to resources for disadvantages populations

**How important to you that public involvement process for hazards mitigation and recovery does the following:**

Scale: 1= not at all 2= slightly, 3= moderately, 4= extremely

  1 2 3 4    utilizes indigenous/local knowledge

  1 2 3 4    improves relations between agencies and citizen

  1 2 3 4    allows input from citizens

  1 2 3 4    influences management outcomes

  1 2 3 4    consider place specific community needs

  1 2 3 4    better representation of marginalized populations

  1 2 3 4    more public involvement in decision making process

  1 2 3 4    create disaster awareness programs and educate them

  1 2 3 4    encourage non-traditional/new solutions

  1 2 3 4    promote social networks among and between communities

**My organization is:**   local\_\_\_\_   regional\_\_\_\_   state\_\_\_\_

**Do you think there is any standardized training for the Non-Governmental Organizations official to help people during emergency response and recovery?**

Scale: 1= not at all, 2= slightly, 3= quite a bit, 4= very much

   1\_\_\_    2\_\_\_    3\_\_\_    4\_\_\_

**If you rate this question low, please explain why?**

_____
_____
_____
_____

**Do you think the Non-Governmental and Governmental organizational are well resourced for emergency response and recovery?**

Scale: 1= not at all, 2= slightly, 3= quite a bit, 4= very much

    1___     2___     3___     4___

**If you rate this question low, please explain why?**

_____
_____
_____
_____

**Do you think there is a county specific formalized plan for all the Non-Governmental Organizations in order to work in a collaborative environment and without duplicating the assistance?**

Scale: 1= not at all, 2= slightly, 3= quite a bit, 4= clearly

    1___     2___     3___     4___

**If you rate this question low, please explain why?**

_____
_____
_____
_____

**Do you think the distribution of funding from Federal grants, HUD, Food Stamps and others are flexible and based upon the needs of local community?**

Scale: 1= not at all, 2= slightly, 3= quite a bit, 4= very much

    1___     2___     3___     4___

**If you rate this question low, please explain why?**

_____

_____

_____

_____



**Please select the most appropriate collaborative activity from the following options which you think that exist within and among various organizations:**


- ○ Verbal communication

- ○ Informal networks

- ○ Sharing of information/data

- ○ Joint project management

- ○ Sharing resources

**Do you think the availability of staff/members is sufficient in Governmental/Non-Governmental Organizations?**


Scale: 1= not at all, 2= slightly, 3= moderately, 4= very much


1___      2___      3___      4___

**If you rate this question low, please explain why?**

_____

_____

_____

_____



**Do you think that the Governmental and Non-Governmental Organizations have flexible/adaptive policies to deal with specific hazard-related problem at community or individual level?**

> Scale: 1= not at all, 2= slightly, 3= moderately, 4= very much

1\_\_\_      2\_\_\_      3\_\_\_        4\_\_\_

**If you rate this question low, please explain why?**

_____
_____
_____
_____

**How often did you participate in the process of developing your community's Disaster recovery plans and policies?**

> Scale: 1= not at all, 2= slightly, 3= quite a bit, 4= very much

1\_\_\_      2\_\_\_      3\_\_\_        4\_\_\_

**If you rate this question low, please explain why?**

_____
_____
_____
_____

**How do you rate the network of Agency (Governmental /non-Governmental) Representatives for sharing and exchange of information?**

> Scale: 1= not at all, 2= slightly, 3= quite a bit, 4= very much

1\_\_\_      2\_\_\_      3\_\_\_        4\_\_\_

**If you rate this question low, please explain why?**

_____

_____
_____
_____

**Please use the following space to share any comments regarding any issues related to disaster response and recovery in your area/community:**

_____
_____
_____
_____
_____
_____
_____
_____

Thank you for your time.

**List of 100 social institutions to which surveys were sent (62 respondents)**

(Manatee Glens Hospital, Human Resources, Risk Management, National Guard, Town of Longboat Key, Realize Bradenton, Family Partnership Center, All Faiths Food Bank, Turning Points, Manatee Religious Services, Camelot Community Care, Meals on Wheels Sarasota, Whole Child Manatee, Volunteers of America, Big Brothers Big Sisters of Sun Coast, Nonprofit Leadership Center of Tampa Bay, Wheels of Success, Humane Society of Manatee County, Volunteer Community Connections, Manatee Children's Services, Inc., Suncoast Community Capital, Goodwill Manasota Foundation, Sarasota Manatee International Airport, Lakewood Ranch Medical Center, Holmes Beach Police Department, Building and Development Services, Manatee Sheriff's Office, Civil Air Patrol, US Coast Guard, Cedar Hammock Fire Rescue, American Red Cross, City of Sarasota, Lakewood Ranch CERT, United Way 211 of Manasota Inc, Manatee County Search and Rescue /MSO, Florida Department of Law Enforcement, Clerk of the Circuit Court, Longboat Key Public Works, City of Anna Maria, Southern Baptist Disaster Services, Manatee County Tax Collector, Southern Baptist Disaster Relief, American Red Cross-Southwest Florida Chapter, City of Palmetto, Parrish Fire District, Fish and Wildlife Commission, Holmes Beach Police Department, Myakka City Fire District, Sarasota Manatee Airport Authority, Fish and Wildlife Commission, Manatee County Rural Health Services, Community Services, Bradenton Police Department, Tropicana, United Way of Manatee County, Building and Development Services, City of Bradenton, Public Works, Bradenton Police Department, Manatee

County Port Authority, Florida Highway Patrol, Salvation Army, Florida Division of Emergency Management, Public Safety, Southern Manatee Fire Rescue, Manatee Community Foundation, Manatee County Habitat for Humanity, Catholic Charities, Manatee YMCA, Women Resource Center Manatee, Jewish Federation of Sarasota-Manatee, Anna Maria Island Community Center, PACE Center for Girls, Southern Baptist Disaster Relief (Florida Baptist Convention) Florida Region 6 Recovery Director, The housing authority of Bradenton, A Life Story Foundation, Action Together Suncoast, African Vision Fund INC, American Chinese Crested Club, Best of All Mankind, Feld Entertainment, Southern Manatee Fire Rescue, Bright House Networks, School District of Manatee County, Disabled American Veterans, Literacy Council of Manatee County, Catholic Charities, Healthy Start Coalition, Foundation of Dreams, Manatee Glens, Safe Children Coalition (Sarasota YMCA), Just for Girls West, ITN Suncoast, United Way Suncoast Manatee, Easter Seals Southwest Florida, Goodwill Industries- Manasota Inc., Gulf shore Animal League, Everlasting Faith Fellowship INC).

# Appendix C: IRB Approval Protocol

University *of* Idaho
**Office of Research Assurances**
**Institutional Review Board**
875 Perimeter Drive, MS 3010
Moscow ID 83844-3010
Phone: 208-885-6162
Fax: 208-885-5752
irb@uidaho.edu

To: Karen S. Humes
Cc: Aparna Kumari
From: Jennifer Walker, IRB Coordinator
Approval
Date:
May 15, 2018

Title: Assessment of social capital for short and long-term post-disaster recovery: A case study

of Manatee County, Florida
Project: 18-091

Certified: Certified as exempt under category 2, 4 at 45 CFR 46.101(b)(2,4).

On behalf of the Institutional Review Board at the University of Idaho, I am pleased to inform you that the protocol for the research project Assessment of social capital for short and long-term post-disaster recovery: A case study of Manatee County, Florida has been certified as exempt under the category and reference number listed above. This certification is valid only for the study protocol as it was submitted. Studies certified as Exempt are not subject to continuing review and this certification does not expire. However, if changes are made to the study protocol, you must submit the changes through VERAS for review before implementing the changes. Amendments may include but are not limited to, changes in study population, study personnel, study instruments, consent documents, recruitment materials, sites of research, etc. If you have any additional questions, please contact me through the VERAS messaging system by clicking the 'Reply' button. As Principal Investigator, you are responsible for ensuring compliance with all applicable FERPA regulations, University of Idaho policies, state and federal regulations. Every effort should be made to ensure that the project is conducted in a manner consistent with the three fundamental principles identified in the Belmont Report: respect for persons; beneficence; and justice. The Principal Investigator is responsible for ensuring that all study personnel

have completed the online human subjects training requirement. You are required to timely notify the IRB if any unanticipated or adverse events occur during the study,
if you experience and increased risk to the participants, or if you have participants withdraw or register complaints about the study.