

**WORKING TOGETHER:  
EXPLORING THE FACTORS THAT INFLUENCE  
INTERORGANIZATIONAL COOPERATION**

by

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Administrative and policy failures increasingly occur because of the inability of organizations to facilitate collective action in the absence of a central, hierarchical authority. I explore how organizations achieve (or fail to achieve) voluntary, self-organizing collective action that is not a direct result of external control, presenting a polycentric system of governance within a set of public, nonprofit, and for-profit agencies operating in the policy domain of emergency management. Using a complex adaptive systems framework (Axelrod and Cohen 1999), I identify the patterns of variation, interaction, and the choices made among agencies that determine whether organizations work together. I develop a model of an integrated, interdependent system of emergency management facilitated by a knowledge commons, as opposed to the established sequential cycle of disaster response.

The research problem addressed, collective action without hierarchy, is fundamentally an issue of decision making. The ability of decision makers to recognize key situations in their environments and develop strategies for action, i.e. cognition, is critical. Analysis of network data and semi-structured interviews finds that urgent need, proximity, and professional capital, a concept developed in this dissertation, promote and sustain cooperation. I show how these factors increase the capacity of heterogeneous networks to accomplish shared goals.

Even if the conditions of urgent need and proximity are satisfied, situations exist where agencies fail to cooperate. Key standards of professional performance—appearance, levels of

staffing, past performance, response time, and the quality of equipment—influence the decisions of emergency managers to work together. I present the concept of professional capital to describe how these recognized standards of professional performance demonstrate competence and justify the decisions of managers to interact. Professional capital transcends jurisdictional and disciplinary boundaries, influencing the confidence of decision makers and shaping judgments based on expectations of performance. This concept adds a missing component to social capital theory, which currently focuses on the roles of pre-established trust and norms of reciprocity in promoting collective action.

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## PREFACE

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## **1.0 HOW ORGANIZATIONS ACHIEVE COLLECTIVE ACTION WITHOUT HIERARCHY**

The present study explores how organizations achieve voluntary, self-organizing collective action that is not a direct result of external control. Administrative and policy failures increasingly occur because of the inability to facilitate collective action in the absence of a central, hierarchical authority. The complexity of many policy problems prevents single organizations from single-handedly defining and resolving critical challenges (Churchman 1967; Haas 1990; Fountain 2001; Ackoff and Rovin 2003; Weber and Khademian, 2008).

The size and scope of many problems require people to work together to find common solutions. Achieving collective action without hierarchy (or interorganizational cooperation), however, is not a simple task (Bardach 1998; Comfort 1999; Chisholm 1989). Within a dynamic, complex system, factors ranging from the demands of the external environment to components of administrative structure and process shape and constrain organizational policy decisions. Some of these components represent standards of professional performance used to decide whether to engage in collective action. These standards encompass what I label “professional capital” and become the basis in many cases for the creation and maintenance of cooperative relationships.

The problem addressed, collective action without hierarchy, is fundamentally an issue of decision making. The ability of decision makers to recognize key situations in their

environments and develop strategies for action, i.e. cognition, is critical. As Herbert Simon (1997) argues, if decision makers fail to recognize problems, they will most likely fail to design administrative arrangements to solve them.

Varying abilities of decision makers to identify shared problems, make sense out of what they see, and devise strategies for collective action exist at different levels of organizations (Klein 1993; 2000; Weick 1995; Hutchins 1995). The task of the present study is to design an inquiry that models the component parts of cooperation to account for the varying-levels of cognition within a system and gain an improved understanding of the factors that promote and inhibit collective action.

I present a polycentric system of governance within a set of public, nonprofit, and for-profit agencies operating in the policy domain of emergency management. I develop a model of an integrated, interdependent system as opposed to the established sequential cycle of disaster response. Using a complex adaptive systems framework (Axelrod and Cohen 1999), I identify the patterns of variation, interaction, and the choices made among agencies that determine whether agencies work together. Across these agencies, information infrastructures allow decision makers to assess their situations, develop what they consider to be appropriate courses of action, and communicate these strategies to others. The resulting knowledge commons (Hess and Ostrom 2007) promotes situational awareness and creates a common operating picture among organizations. The resulting system of governance includes a range of operational and administrative relationships that vary in terms of their levels of intensity and commitment.

The recognition of urgent need largely drives cooperation in the field study area. The ability to recognize need is developed through past experiences and the search and exchange of critical information within the knowledge commons. Once need is recognized, decision makers

decide whether to cooperate with others or rely on their agency's internal capacity to cope with problems. Close proximity (geographic and conceptual), as outlined in Chapter 7, influences this decision. However, adjacent agencies at times fail to work together despite the recognition of urgent need.

While factors such as competition between agencies and personality disputes inhibit cooperation, the present study argues that key standards of professional performance used by decision makers to decide whether to work with other agencies represent a critical concept. I use this concept, professional capital, to explain how standards of professional performance demonstrate competence and justify the decisions of managers to interact. These evaluative criteria include the conditions of equipment, the appearance of personnel, the ability of personnel to work well with others, and the results of past performance. Professional capital transcends jurisdictional and disciplinary boundaries, influencing the confidence of decision makers by shaping judgments based on expectations of performance. This concept adds a missing component to social capital theory, which currently focuses on the roles of pre-established trust and norms of reciprocity in promoting collective action.

## **1.1 DEFINING COOPERATION, COORDINATION, COLLABORATION, AND COOPERATIVE ACTIVITIES**

Cooperation, coordination, and collaboration, as a continuum of action, are processes of bilateral or multilateral problem definition, direction setting, and implementation (Cigler 1999; Gray 1989). Facilitated by communication and cognition, they are emergent processes that change as

patterns of interaction and information exchange foster trial-and-error learning. People and organizations engage in different degrees of cooperation, coordination, and collaboration in contexts that vary in size (in terms of numbers of agencies), complexity (in terms of tasks and the demands of the external environment), and levels of urgency.

The present study defines interorganizational cooperative activities as any multiparty initiative between agencies intended to achieve operational or administrative goals. The definition is intentionally broad in order to explore multiple types of collective action. Cooperation on one activity may influence cooperation on another. The present study acknowledges multiplexity, the existence of multiple types of relationships between any two agencies (Isett and Provan 2005), in order to understand the influence of other agencies within what Ostrom (2005) calls a nested set of organizations.

The present study's definition includes the concepts of cooperation, coordination, and collaboration as defined by other studies that describe a continuum of action, ranging from the loosely coordinated pursuit of a common goal to more intense, problem-solving activities in which innovation occurs. Simon (1997) uses the term cooperation "for [an] activity in which the participants share a common goal," and the term coordination "for the process of informing [participants] as to the planned behaviors of others" (p. 81). The act of coordination to Chisholm (1989) is "to place or arrange things in proper position relative to each other and to the system of which they form parts..." (p. 13). Chisholm's definition assumes that the participants' goals and strategies have already been more or less established prior to the act of coordination.

For more ambiguous or emergent situations, collaboration is defined as an intensive problem-solving process between two or more participants in which innovation occurs (Agranoff and McGuire, 2003; Denise, 1999; Shrage, 1995). This notion of collaboration fits Comfort's

(2007) definition of self-control where self-organizing, adaptive actors engage in reciprocal patterns of interaction driven by “the capacity to keep actions focused on shared goals” and recognize when to engage in collaborative problem solving and when to disengage (Comfort, 2007, p. 195).

Cooperative activities, in general, manifest along a continuum ranging from cooperation to coordination to self-controlled collaboration. Cigler (1999) explains this continuum, which includes a range of purposes, intensity, and formality in terms of official agreements.

Each continuum type differs in complexity of purposes (e.g., information sharing vs. complicated, joint problem-solving), intensity of linkages (based on common goals, decision rules, shared tasks, and resource commitments), and the formality of agreements reached (informality vs. formality of rules guiding operating structures, policies, and procedures)... (p. 87).

Interorganizational cooperative activities are more complex than simple binary representations of whether participants interact. Defining interorganizational cooperation broadly and studying the concept within a complex adaptive systems framework allows the present study to more aptly model this dynamic process of information exchange, feedback, and decision making.

## **1.2 SIGNIFICANCE OF THE POLICY PROBLEM: COLLECTIVE ACTION WITHOUT HIERARCHY**

The inability to facilitate collective action without hierarchy is a fundamental problem in political science, public administration, and public policy as interorganizational cooperation and horizontal models of governance continue to gain prominence in both theory and practice

(Ostrom 2005; Hooghe and Marks 2003; Feldman and Khademian; 2002; Chisholm 1989).<sup>1</sup> Identifying the factors that influence cooperation is significant because it improves our understanding of the structures and processes of governance and improves our operational ability to respond to change. It allows us to initiate policies that promote governance structures that focus on organizations voluntarily solving shared problems. Governance, after all, is considered to be a “collective decision-making process” between organizations across sectors and levels of government (Miller and Lee 2011, p. 126). The focus on voluntary cooperation, following Bardach’s (1998) notion of “getting agencies to work together” and Comfort’s (1999) vision for self-adapting organizations, represents an alternative to traditional, hierarchical administrative strategies such as command-and-control. I explore how organizations achieve a unity of effort without necessarily creating a clear unity of command.

The increasing complexity and interdependency of policy arenas (Ackoff and Roven 2003; Ostrom 2005; Dunn 2008) and the corresponding increase in horizontal administrative arrangements (Feiock and Scholz 2010; Miller 2002; Salamon, 2002; Kettl, 2002) necessitate an improved understanding of what promotes and what inhibits collective action without a clear hierarchy. Whether in the public, private, or nonprofit sectors, the ability to cooperate increasingly distinguishes an organization’s capacity to adapt to changing conditions. The present study’s goal is to create a model of how organizations can interact more effectively and efficiently and offer possible alternatives on how to create more effective, less expensive delivery of public services through cooperation, which will be a contribution to the governance

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<sup>1</sup> Practitioners and theorists alike recognize the increasing importance of cooperative arrangements across sectors, ranging from information sharing to more collaborative, resource-intensive activities (Agranoff, 2007; Kettl 2002; Salamon 2002; Cigler 1999).



and institutional collective action literatures. I present a model of a polycentric system of governance that through many cooperative activities serves the needs of a specific policy arena, emergency management.

### **1.3 THEORETICAL QUESTIONS: EXPLORING THE FACTORS THAT INFLUENCE COLLECTIVE ACTION WITHOUT HIERARCHY**

The present study uses complex adaptive systems theory as well as work on administrative decision making, particularly the role of cognition, as a theoretical basis on which to explain how, when, and why organizations cooperate. It uses the three concepts of variation, interaction, and selection to characterize how systems operate without a central authority, applying Axelrod and Cohen's (1999) broad framework to a specific domain of administrative practice. It advances administrative theory by using a complex adaptive systems lens through which to view the structure and process of cooperation in a particular field study setting. I identify variation within the system, the interaction that takes place, and the decision making process in which agencies either select or reject the strategy of collective action.

The first theoretical question posed in the present study explores the variation that exists in terms of agencies, their missions, the demands of the external environment, and their ability to engage in collective action. Variation among agencies and their environments creates different strategies for action as well as abilities to recognize need, which may present barriers to cooperation or may serve as a source of innovation depending on the system's ability to adapt. The second theoretical question focuses on the interaction that occurs within the field study area. Patterns of interaction (who interacts with whom, to what extent, and for what purposes)

influence information exchange and shapes and constrains the decision making of organizations. The present study models the patterns of interaction that occur to identify the structure of the system. Finally, the third theoretical question explores the factors that promote and/or inhibit the decision to engage in collective action. This is fundamentally a question of selection. What factors influence the selection of specific strategies for collective action? The results are comprised of a mix of external demands as well as components of administrative structure and process. Several of these components amount to professional capital, which becomes the basis for collective action. These decisions serve as the building blocks for a polycentric system of governance.

#### **1.4 ORGANIZATION OF THE STUDY**

The present study is divided into ten chapters. Chapter 1 outlines the problem of collective without central authority and the theoretical questions of variation, interaction, and selection. The significance in terms of policy salience and timeliness demonstrates the importance of the study.

Chapter 2 reviews what has been written about collective without central authority. The range of literature is considerable. Many notable thinkers have addressed the problem. Perspectives include theories of collective action both inside and outside of the context of the policy domain of emergency management. Ostrom's (2005) institutional analysis and development (IAD) and complex adaptive systems are reviewed for relevance and evaluated regarding their contributions to identifying factors that promote cooperation. Understanding that interorganizational cooperation is a strategy used by actors to adapt to changing conditions is

critical in framing the issue in a dynamic context and hopefully adds to the available body of knowledge.

Chapter 3 explores the challenge of matching limited methodological tools with the complex, dynamic nature of the research problem and the field study area. The advantage of a mixed-methods approach is reviewed as are the research questions, methods, and available data. Chapter 3 also devotes considerable attention to the operationalization of constructs and their implications with respect to validity and reliability.

Chapter 4 outlines variation in terms of the demands of the external environment and the available strategies for managing risk and organizing administrative tasks. It identifies the variation that exists among system participants, their roles and functions, their exposure to risk, their vulnerability, and their ability to reduce risk. This variation creates heterogeneity across agencies with respect to their strategies for action.

Communication between agencies helps to create a common knowledge base. This information facilitates the recognition of opportunities for collective action. Chapters 5 and 6 model patterns of interaction, identifying the levels of system integration achieved through interorganizational cooperation. Chapter 5 outlines the various types of cooperative activities in the field study area and identifies which agencies engage in them. In Chapter 5, I argue that cooperative activities are the building blocks for polycentric systems of governance. I present a model of an integrated, interdependent system of emergency management as opposed to the established sequential cycle of disaster response.

Chapter 6 focuses on the existing patterns of interactions among agencies during one specific cooperative activity, response operations during emergencies. It identifies key actors as well as the architecture of the system, describing it as both a small-world and a scale free

network (Watts and Strogatz 1998; Barabási and Albert 1999). The structure demonstrated is characterized by several subgroups of densely connected agencies (a small world model) linked together by a core group of highly connected boundary spanners (a scale-free network). These findings reveal what I label as a neighborhood-centered network model for emergency management.

Chapter 7, 8, and 9 explore why managers select various cooperative strategies or fail to do so. The policy decision to cooperate is influenced by elements of both administrative structure and process. Components of structure include organizational designs, goals, resources, and rules. It also encompasses the technical infrastructure used to store and communicate information. Components of process include organizational culture, leadership, and the role of interpersonal relationships. Decision makers recognize these components at different rates and in different ways. Chapter 7 explores the elements of administrative structure. Chapter 8 investigates the components of administrative process. Chapter 9 identifies the key threshold points that influence the decision to cooperate. In this chapter, I identify the standards of professional performance that demonstrate competence and justify the decisions of managers to cooperate. I label this concept professional capital.

Chapter 10 reviews the present study's major findings and implications. It offers policy recommendations to promote collective action, such as the injection of information technology and other best practices. Finally, I identify theoretical questions and suggest paths for future research.

## **2.0 CONCEPTS THAT PROMOTE OR INHIBIT COLLECTIVE ACTION WITHOUT HIERARCHY**

This chapter identifies the key factors that influence interorganizational cooperation as found in the extant literature dealing primarily with public and nonprofit agencies. Several studies demonstrate that collective action does indeed occur in the absence of a command-and-control, centralized authority on both the individual level (Axelrod 1984) and the organizational levels (Chisholm 1989; Mattessich and Monsey 1992; Bardach 1998). Various studies have introduced factors as either individual variables or as components of larger, interdependent systems. The first sections of this chapter identify several variables. The final sections review relevant research on dynamic systems that offer approaches to understand cooperation within complex, multi-level policy arenas. Ostrom's (2005) concept of nested sets and Axelrod and Cohen's (1999) model of complex adaptive systems prove to be particularly appropriate for the present study.

Olson's (1965) initial work on collective action theory provides the foundation upon which others, such as Institutional Collective Action (ICA) theorists, build. Problems of free riding and cost minimizing, as identified in the literature, remain major obstacles to collective action (Bardach 1998). Williamson's (1975) research on transaction costs and subsequent work (Brown and Potoski 2003; Feiock 2007; Feiock, Steinaker, and Park 2009) provide useful ideas on some of the constraints faced by decisions makers in deciding whether to work across

organizational boundaries.

Other research on interorganizational cooperation indicates that shared and/or interrelated problems as well as complementary goals are important factors (Gray 1989; Bardach 1998; Cigler 1999). Complex adaptive systems (CAS) research tells us that the proximity of two actors both in terms of physical space and conceptual space also increases the likelihood of cooperation (Axelrod and Cohen 1999).

Several factors either promote or inhibit cooperation depending on the context of the situation. These factors include formal incentives to act and the state of cognition, i.e. the ability of decision makers to recognize and understand key elements in their environments. Factors also include the organizations' capacity for learning and various community attributes that constrain possible actions and outcomes.

The sections below introduce several interrelated concepts dealing with complexity and how they represent the architecture of cooperation. These concepts—complex adaptive systems, scale-free networks, and the small-world model—hold implications for identifying the factors that influence interorganizational cooperation. Elinor Ostrom's (2005) work also offers an effective conceptual framework to explore cooperation in multi-level systems.

## **2.1 FACTORS THAT PROMOTE COOPERATION**

### **2.1.1 Shared and/or Interrelated Problems as Opportunities to Cooperate**

Shared and/or interrelated problems create opportunities to pursue joint gains and common goals (Bardach 1998; Gray 1989) and reduce shared risk (Comfort 1999). The recognition of shared or

interrelated problems creates a rationale for joint action. Where common ground, i.e. the clarity of common purpose between organizations, is established, multilateral approaches can be developed to affect change (Bardach 1998; Gray 1989; Schermerhorn 1975). Clearly defined problems enable the creation of goal consensus, which is helpful in promoting cooperation (Agranoff 2007; Goldsmith and Eggers 2004). However, goal consensus is not necessary for collective action as specific individual goals can differ, but interrelate and promote interaction (Provan and Kenis 2008).

Ill-structured problems—where actors exhibit conflicting and/or different perspectives and cannot reach common ground—represent a major barrier to collective action (Weber and Khademian 2008; O’Toole 1997). When decision makers fail to reach consensus on identifying a problem, an agreement on joint strategies for action is less likely. The recognition of interrelated problems, therefore, offers an important impetus for collective action. The mutual recognition of shared and/or interrelated problems can be prompted by several factors including fiscal stress, focusing events, and/or threats to the stability of organizations posed by dynamic, changing conditions.

#### **2.1.1.1 Fiscal Stress**

In circumstances where organizations experience or anticipate fiscal stress, cooperative arrangements offer strategies to ensure organizational survival and maintenance (Cigler 1999). For example, organizations have the option to “contract out” the production and/or provision of goods and services to other agencies to achieve cost savings (Savas 1987). Also, resource sharing is a common strategy in which organizations share personnel, information, and equipment in order to achieve cost savings (Kearns 2000).

A central challenge faced by local government agencies, for example, is to provide

needed services in the face of fiscal pressure (Carr, LeRoux, Feiock, and Shrestha 2007). Fiscal stress or perceived stress encourages cooperation as decision makers attempt to reduce costs or maintain several levels (Cigler 1999; Sonenblum, Kirlin, and Ries 1977; Joassart-Marcelli, and Musso 2005). Lack of revenue forces officials to adapt and find other strategies to address service provision needs.

High per capita property taxes are considered an indication of municipal fiscal stress (LeRoux and Carr 2007). Interestingly, LeRoux (2006) and Morgan and Hirlinger (1991) find that both very low income and very high income encourages cooperation. Increased federal and state revenue are considered an indicator for cooperation (Krueger and McGuire 2005; LeRoux and Carr 2007). High levels of intergovernmental revenue may indicate fiscal stress and in some instances may be contingent upon cooperation.

#### **2.1.1.2 Focusing Events**

Focusing events (Baumgartner and Jones 1993; Kingdon 1984) such as disasters (Comfort 1999) direct attention to problems and lead to cooperation between organizations (Cigler 1999). They provide opportunities for organizations to recognize urgent need and develop strategies to address specific problems. They also create environments in which more people are willing to contemplate strategies not previously considered feasible and take steps to initiate change (Keeler 1993).

#### **2.1.1.3 Vulnerability**

Organizations attempt, in varying degrees, to balance the exploitation of existing strategies with the exploration for innovation (March 1999; Axelrod and Cohen 1999).

Organizations that achieve an appropriate balance are more likely to recognize risk and



vulnerability as they attempt to reconcile their internal goals and capabilities with the changing demands of their external environments. Identifying an organization's vulnerability to any number of risks prompts the formation of innovative strategies, including cooperative arrangements, intended to mitigate negative consequences (Mileti 1999; Comfort 1999).

### **2.1.2 Complementary Goals**

Shared and/or interrelated problems create common cause. Complementary goals and missions offer opportunities for cooperation between organizations (Kearns 2000; Cigler 1999). In certain cases, organizations and people are willing to overcome costs and invest their time, energy, and resources to achieve goals, whether they are directed toward specific mission-driven outcomes, the desire for survival/maintenance, or the increase in the existing stock of knowledge, skills, and/or number of external relationships. For the most part, participants expect to gain some sort of value-added benefit as a result of cooperation (Schermerhorn 1975; Gray 1989). However, depending on the mission and culture of the organizations, what constitutes a perceived benefit ranges from the desire for material gain to other goals such as increased public visibility, the advancement of a community-oriented mission, the creation of synergies to achieve more with less, and the elimination of duplicated services (Kearns 2000).

With respect to the goal of organizational survival and maintenance, resource dependence theory anticipates that organizations lacking materials or expertise will pursue relationships with organizations that possess them (Pfeffer and Salancik 1978). In this case, there is a motivated organization that seeks out assistance from a more powerful actor that may receive remuneration in return for services. Their goals, while not the same, complement each other and facilitate cooperative arrangements.

Cost saving represents one of the most prevalent expectations that motivate cooperative arrangements between local governmental agencies (Sonnenblum, Kirlin, and Ries 1977; Stein 1990; Hamilton 1999; Hodge 2000; Post 2004). In addition to cost saving, local government agencies see cooperation as a means to improve the quality and effectiveness of their public goods and services (Stein 1990; Thurmaier and Wood 2002; Post 2004).

Local government agencies use cooperative arrangements to ensure service continuity across jurisdictional boundaries. Service continuity reduces the likelihood that residents will leave for neighboring communities that offer better goods and services (Ugboro, Obeng, and Talley 2001; Post 2004). Common goals clearly motivate certain agencies to work together.

### **2.1.3 Immediate Benefit**

Cooperation is more likely, according to Axelrod (1984), if participants perceive the attainment of an immediate benefit as it provides justification for interaction and an incentive for future work. The anticipation of an immediate benefit reduces ambiguity and the apparent risks of investing in a cooperative relationship. Axelrod (1984) does not argue that an immediate benefit, as opposed to a long-term benefit, is necessary for cooperation, but rather immediate payoffs increase the likelihood for collective action.

### **2.1.4 Trust**

Preexisting trust is seen as a major factor that facilitates interaction (Axelrod 1984; Putnam 2000; Gulati and Nickerson 2008). Trust emerges in situations where actors are familiar with

each other, interact over time, and develop respect for one another (La Porte and Metlay 1996). Trust lowers transaction costs and other barriers to cooperation (Feiock 2007).

### **2.1.5 Norms of Reciprocity and the “Shadow of the Future”**

More than trust, Axelrod (1984) finds that reciprocity in anticipation of future interaction facilitates cooperation. To maintain cooperation, two key conditions are that “cooperation [is] based on reciprocity and that the shadow of the future is important enough to make this reciprocity stable” (Axelrod 1984 p. 173). Actors decide to cooperate largely with the expectation that their cooperation will be reciprocated in time or they will be repaid in some way (Ostrom and Walker 2003). Thurmaier and Wood (2002) argue that local government personnel are motivated, not solely by cost benefit ratios, but by their desire to help their neighbors and engender reciprocity for future interaction.

The concept of “the shadow of the future” represents the extent to which actors envision future interaction. Increased frequency of interaction increases the likelihood that actors anticipate future cooperation, thus the stability and durability of a relationship may be strengthened by more interaction.

### **2.1.6 Network Management Skills**

In public management networks, top-down administrative skills often fail to achieve key processes in terms of attaining group consensus, organizing work, and making other types of decisions especially in situations where power is shared, but not necessarily equal (Kickert and Koppenjan 1997; Milward and Provan 2000; Agranoff and McGuire 2003; Arganoff 2007).

Cooperation is more likely when managers exhibit effective network management skills such as “big-picture thinking, coaching, mediation, negotiation, risk analysis, contract management, ability to tackle unconventional problems, strategic thinking, interpersonal communications, project and business management, and team building skills” (Goldsmith and Eggers 2004, p. 158). While considerable gaps remain in the literature regarding how administrators manage networks (at different levels and with various purpose), communication skills and the willingness to share information represent key characteristics, particularly by people who demonstrate knowledge in their organizations’ activities, regulations, and abilities. Knowledge of organizational capacity facilitates the recognition of opportunities to cooperate or the potential to improve existing arrangements (Agranoff 2007, p. 105). Network management skills bolstered by knowledge and experience promote interorganizational cooperation.

### **2.1.7 Proximity (Physical and Conceptual)**

It is logical to assume that an actor is more likely to cooperate with others that are in close proximity to them in terms of both physical space (geography) and conceptual space (a set of categories related to ideas, missions, and goals) simply because they have a greater chance of coming into contact with them (Axelrod and Cohen 1999). In social networks, actors exhibit the tendency to interact with others who share similar characteristics (Holland 1995). Lazarsfeld and Merton (1954) coined the expression homophily to describe the phenomenon, based on Burton’s (1927) observation that “birds of a feather flock together.” Organizations follow this pattern at times. For example, “applied to local government institutions, homophily suggests that one jurisdiction will only cooperate with another if the characteristics of the communities are similar” (LeRoux 2006, p. 34). Physical and conceptual proximity (in terms of spatial closeness

and mission similarity) offer organizations similar characteristics that “consistently facilitate the formation of aggregates...” (Holland 1995, p. 12), i.e. they promote cooperation.

In Institutional Collective Action (ICA) research, variables based on geographic location are often included to measure the institutional supply of potential cooperative partners. These geographic variables include the concepts of adjacency (LeRoux 2006; Feiock 2007; LeRoux and Carr 2007; Post 2004), density within a given geographic area (Ferris and Graddy 1986; Post 2004), and collocation within the same metropolitan statistical area (Morgan and Hirlinger 1991; Krueger and McGuire 2005). The literature suggests that increased adjacency and density increase the likelihood for cooperation (Post 2004).<sup>2</sup>

## **2.2 FACTORS THAT INHIBIT COOPERATION**

### **2.2.1 Transaction Costs**

Cooperative arrangements exact costs in terms of time, energy, information, and resources. These transaction costs represent major barriers to decision makers considering collective action. Five types of transaction costs affecting decision makers in public agencies have been identified. They include bargaining costs, information/coordination costs, negotiation/division costs, enforcement/monitoring costs, and agency costs (Feiock 2007). According to Feiock, Steinaker, and Park (2009, p. 257), decisions makers face the following costs in organizing and

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<sup>2</sup> Morgan and Hirlinger (1991) find that a local government unit’s location in an MSA increases the likelihood for cooperation, while Krueger and McGuire (2005) find the opposite.

administering a cooperative agreement:

- Personnel face **bargaining costs** in negotiating arrangements.
- Personnel face **information costs** while collecting information to identify the preferences of other stakeholders and predict possible outcomes.
- Personnel accrue **negotiation/division costs** when deciding how the final good or service will be allocated among participants.
- Personnel face **costs in enforcing and monitoring** the production and distribution of the good or service. Accountability mechanisms would be included in this category.
- Personnel confront **agency costs** when public representatives do not fully represent the preference of those they govern. Any effort to gauge the will of the constituents on a subject is considered an agency cost.

Information helps organizations to overcome transaction costs. Proponents of transaction cost theory argue that decision makers weigh the costs and benefits of each type of transaction in deciding to cooperate. “The necessary condition for any cooperative agreement is an increase in benefits, and the larger that gain, the more likely it will outweigh the transaction costs necessary to achieve it” (Feiock, Steinacker, and Park 2009, p. 258). Cooperation occurs when actors find it in their self-interest (Mattessich and Monsey 1992; Feiock 2004). The ability to seek out, exchange, and act upon information helps to determine whether organizations choose to overcome costs. This type of decision making requires timely, accurate information to make informed choices.

With respect to the provision of services among local governments, for example, the quality and timeliness of information affects the ability of government officials to decide

whether to produce a service in-house or select some other alternative, i.e. contracting out (Brown and Potoski 2003). It has been argued that critical information useful to make an informed decision regarding joint service provision or the co-production of a public good includes asset specificity and measurability (Williamson 1975; Brown and Potoski 2002; Feiock, 2007). The ability to clearly identify asset specificity, i.e. the level of unique investment needed to produce a good or service, and measurability, i.e. the ability to measure that good or service, reduces uncertainty and, in turn, lowers transaction costs (Williamson 1975; Andrew 2006).

### **2.2.2 Free Riding and Cost Minimizing**

The now classic conception of collective action identifies the free-rider problem as a major impediment to cooperation in which several actors consume a public good without contributing to its production. In this context, actors who engage in production eventually are disinclined to use their resources when others fail to reciprocate (Olson 1965). Situations in which the exclusion of consumers is costly creates the potential for free riding as actors have a strong incentive to enjoy the public good at little to no cost (Olson 1965; Ostrom 2005). In some circumstances, organizations that are not free riding attempt to minimize their contributions to the production effort. Efforts to minimize and/or shift costs occur frequently in interorganizational cooperation and inhibit future interaction (Bardach 1998).

#### **2.2.2.1 Accountability in Cooperative Activities**

Free riding and cost minimizing limit the viability of cooperative arrangements, as actors willing to contribute to the common project face the prospect of either giving away valuable resources or paying additional costs in terms of establishing an accountability regime to ensure

group compliance (Kearns 1996). Group members also worry about the attainment of goals and the risk of failure. There is no one-size-fits-all accountability strategy for cooperative relationships (Kearns 2011). In situations in which clear principle-agent relationships exist, traditional accountability strategies apply. However, when a hierarchy is not obvious, other strategies are needed (Koliba, Mills, and Zia 2011; Gugerty 2009; Goldsmith and Eggers 2004). In certain situations, accountability models such as the adherence to professional standards of performance (Bardach 1998; Smith and Lipsky 1993; Romzek and Dubnick 1987) and the need to fulfill public expectations (Behn 2001; Kearns 2011; Mulgan 2000) provide baseline assurances that enable agencies to overcome the fear of free riding and cost minimizing without making major investments in accountability regimes. These types of accountability mechanisms depend on either direct or indirect peer pressure or pressure from outside constituents to assess performance and enforce standards.

## **2.3 FACTORS THAT EITHER PROMOTE OR INHIBIT COOPERATION**

### **2.3.1 Incentives**

Individual incentives and externally-generated incentives motivate or inhibit people within organizations to enter into cooperative arrangements (Bardach 1998; Cigler 1999; Andrew 2006). Organizations do not have to share the same incentives in order to reach common ground. Incentives—whether exactly the same across organizations or simply complementary—promote either action or inaction and ought to be identified to understand the factors that promote cooperation.



Potential benefits that prompt action are shaped by both pre-established policies and emergent rules created during the process of interaction (Comfort 2002; Gray 1989; Ostrom 2005). Identifying the actions that participants are allowed to take within a given situation and identifying the incentives, as outlined by relevant organizational policies and rules (both internally and externally-produced), help us to understand the process of cooperation (Ostrom 2005).

### **2.3.1.1 Externally-generated Incentives**

Externally-generated incentives such as selective benefits and/or coercion from outside actors affect cooperation (Post 2004). Federal and/or state grants, for example, motivate third-party governance activities, which include cooperative arrangements (Goldsmith and Eggers 2004; Salamon 2002a; Osborne and Gaebler 1992). Olson (1965) concludes that only coercion can keep large groups together. However, this maxim has not held up to empirical testing (Axelrod 1984; Feiock 2004). Regardless, external incentives, in general, remain a viable, though not necessary, motivation for cooperative arrangements (Post 2004).

### **2.3.1.2 Individual Incentives**

In addition to externally produced incentives, participants may be motivated to cooperate by various individual inducements. Bardach (1998) identifies three primary individual purposes to act, including careerist, bureaucratic, or value-creating incentives. A careerist incentive motivates the individual actor who seeks “ease, security, income, prestige, and power in the work setting” (Bardach 1998, p. 32). This type of incentive is characterized by the classical conception of the self-interested, utility maximizer. Bureaucratic incentives motivate individuals to “protect or enhance the [organization’s] resources” (Bardach 1998, p. 32). Careerist and

bureaucratic incentives prompt people to follow established rules and maintain the status quo within organizations. Both sets of incentives intertwine, especially as an individual gains bureaucratic turf and, at the same time, expands his or her power and influence.

A value-creating purpose “aim(s) to improve the effectiveness or productivity of a program or agency in regard to its espoused mission...” (Bardach 1998, p. 32). Value-creating incentives drive participants to pursue collective benefits that represent the public good (Bardach 1998; Moore 1995). The careerist and bureaucratic notions of incentives fail to account for the possibility that people genuinely desire to work creatively toward innovation. Thurmaier and Wood (2002) assert that local government personnel are motivated, not solely by cost benefit ratios or careerist incentives, but by their desire to “be good neighbors.” Nonprofit organizations often depend on employees and volunteers that donate time, money, and resources to achieve organizational missions (Salamon 2002b; Bryson 2004). This value-creating incentive is a motivation that requires further investigation to gauge its effect on interorganizational cooperation.

### ***Careerist-Incentives for Professional Administrators***

In addition to altruistic purposes, some professional administrators initiate cooperative ventures to demonstrate innovative leadership, which may propel them to career advancement and promotion. Paid personnel have greater access to information (such as state-of-the-art innovative strategies) and are more likely to interact with their counterparts in other local governments than are elected officials (Frederickson 1999). Their information costs in initiating a new practice are much lower than other stakeholders as their search for information is facilitated by their professional network (Brown and Potaski 2003). They do not share the same aversion to risk as elected officials.

### *Careerist-Incentives for Elected Officials*

Elected officials are risk adverse because voters hold them accountable every two to four years; therefore, they are generally reluctant to alter existing patterns of interaction and service provision practices (Frederickson 1999). However, aspirations for higher office motivate elected officials to pursue cooperation (Feiock, Steinaker, and Park 2009). Limited turnover (Feiock 2007; Clingermayer and Feiock 2001) and greater tenure (LeRoux 2006; Frederickson 1999; Feiock 2007) are considered to be positive indicators of cooperation as stability and job security ease apprehensions to initiate change.

#### **2.3.2 Cognition**

Decision making, itself, is an important factor in understanding how organizations make the choice to cooperate. As stated above, the ability to recognize common problems and cause facilitates collective action. Cognition relates to the awareness, intuition, and reasoning of both individuals and groups and is a vital component for the decision making process, representing the extent to which people recognize key elements in a situation, relate them to past experiences, and formulate action strategies to cope with changing conditions (Klein 1993, 2000). The ability to comprehend the nature of a situation and how particular actions might affect the environment improves decision making considerably (Comfort 2007; Hutchins 1995). It is as simple as Simon's (1997) recognition that people cannot create what they do not understand. The recognition of a problem is a fundamental step to dealing with change. Without recognizing the problem, people cannot develop strategies for action that engage group participation across a distributed system. The ability to make sense out of a situation (Weick 1995) and recognize where and when collective action is advantageous is a major factor in determining what

organizations cooperate, with whom, and when.

### **2.3.2.1 Recognition**

People make sense of ambiguity by considering history, interacting with others, and taking cues from their surroundings. They focus on making plausible interpretations that facilitate the recognition of problems and corrective action (Weick 1995). Klein's (1993; 2004) recognition-primed decision making (RPD) model criticizes the rational decision-making framework in which people carefully consider alternatives based on complete information. Instead, "the focus is on the way [decision makers] assess the situation and judge it familiar" with past experiences (Klein 2004, p. 30). People link what they are witnessing with elements of prior experiences or things they have seen in the past. They take what they recognize and put the pieces together in a new way that helps them to interpret a given situation. It is after they recognize, or make familiar, a situation that they develop a strategy for action, which may include cooperation.

### **2.3.2.2 Developing a Strategy for Action**

According to Klein (2004), decision makers imagine the execution of possible scenarios to deal with recognized problems. The first workable option, as formulated by decision makers, is usually selected, as opposed to the best option from a list of alternatives. This process is facilitated by a decision makers' intuition. "Intuition depends on the use of experience to recognize key patterns that indicate the dynamics of the situation" (Klein 2004, p. 31). Past experience and training help to develop this type of decision making ability (Flin 1996). Exploring the experience of leaders and frontline personnel alike facilitate an understanding of the role of intuition in decision making. If decision makers have not experienced and/or learned

of positive cooperative arrangements relative to a specific situation, they are less likely to choose a cooperative strategy.

### **2.3.2.3 Distributed Cognition**

Cognition takes place not only on the individual level, but also within a system where knowledge is distributed (Hutchins 1995). In *Cognition in the Wild*, Edwin Hutchins (1995) acknowledges that “the complexity of a system may make it impossible for a single individual to integrate all the required information” (p. 241). Hutchins (1995) recognizes that knowledge is distributed and that people require decision support to understand complex environments and to coordinate multifaceted tasks. This decision support involves people crossing boundaries and interacting with others as well as with technical systems to acquire valuable information. As Louise K. Comfort (2009) puts it “distributed cognition acknowledges that no one individual possesses the knowledge, skills, or capacity to manage rapidly evolving, interdependent events” (Comfort 2009, p. 1).

In short, distributed cognition creates a group process of sharing, comprehending, correcting, and learning as people pursue joint strategies. As information is shared, each additional piece of information represents a potential catalyst for change as people enlarge their understanding of relevant problems and potentially identify new strategies for action. Organizations that demonstrate robust patterns of communication and problem solving capacities should be more flexible and therefore able to identify cooperative strategies.

### **2.3.2.4 Socio-technical Systems**

Technical systems facilitate cognition and the social processes of information search and exchange. Socio-technical approaches to understand system dynamics recognize the uniqueness

of both social and technical systems, but they also recognize their interdependence and the need to design systems that facilitate an appropriate balance (Comfort 2007). These systems are often complex and “consist of large-scale physical infrastructures (such as transportation systems and power distribution grids) embedded in a dense web of communication and computing infrastructures whose dynamics and evolution are defined and driven by human behavior” (Vespignani 2009 p. 425). If the interplay between social processes and technical structures are understood then, theoretically, it is possible to anticipate the behavior of these systems.

Organizations increasingly depend on information technology to facilitate communication. “A socio-technical system integrates humans, computers, and organizations in an interactive system that transmits, receives, stores, and acts on information from the environment” (Comfort 2002, p. 35). It is clear that organizations depend on technical systems for communication and information processing (Hutchins 1995; Simon 1996; Fountain 2001). These organizational arrangements are critical components to organizational learning (Argyris 1993; Argyris and Schön 1995). It is recognized that system performance often depends on a robust communication process and data repository that transmits information to the key decision makers in a timely fashion and allows for feedback to correct error and/or to anticipate uncertainty (Graber 2003; Argyris 1993; Schein 1992).

Communication is critical to cooperation (Graber 2003; Chisholm 1989; Gray 1989; Axelrod 1984). How technology facilitates cooperation depends not only on the capabilities of the technology itself, but also the social processes inherent in the organization and in the system. The internet, for example, does not in itself foster cooperation, but it contributes as a facilitator of communication. “The internet allows networked organizations to extend control and coordination more easily across organizations. Information technology does not, and cannot by

itself, create social capital or cooperation, in the absence of a base of trust; but if easier communication and coordination lead to enhanced trust, then the Internet contributes” (Fountain 2001, p. 79-80). Understanding the dynamics implicit to socio-technical systems is critical to initiating and managing cooperation.

### **2.3.2.5 Importance of Cognition**

Understanding cognition is a key to understanding how decision makers select a specific strategy, i.e. whether to cooperate or not. People and groups have varying levels of cognition. High levels enable decision makers to recognize problems, effectively develop solutions, and communicate strategies throughout the system. Understanding cognition on the individual and group levels as well as identifying the key threshold points where decision makers decide to cooperate are critical tasks for the present study.

Determinants based on either structure or process are insufficient in recognizing the factors that affect cooperation without acknowledging cognition because cognition offers a glimpse into a person or group’s ability to solve problems. Identifying cognition also facilitates the identification of a person’s priorities and thresholds that tell us what a person will tolerate in terms of the status quo and conversely, what motivates a person to act, including entering into cooperative arrangements.

### **2.3.3 Capacity for Organizational Learning**

Entering into interorganizational cooperative activities requires varying degrees of change both with respect to managerial procedures and frontline operations. Cooperation, therefore, requires, to a certain extent, a willingness to change and learn. The capacity of organizations to learn as

demonstrated by their technical infrastructure, flexibility, and culture facilitates their ability to adopt cooperative arrangements, especially in the face of dynamic, external environments.

In assessing an organization's ability to adapt to changing conditions, three indicators are particularly useful: 1.) The type of **technical infrastructure** that organizations use to seek out, exchange, and retain information, 2.) The degree of **flexibility** embedded in a.) Organizations' policies that affect personnel's ability to initiate change, b.) Patterns of formal and informal information exchange (including feedback loops), c.) The possession of smart/best practices (Bardach, 1998), and d.) Personnel's experience and training, and 3.) The components of organizations' **culture**, including a.) The extent to which they value of information sharing, b.) Their commitment to the public good, c.) Their openness to new information, d.) The ability of leaders to challenge fixed organizational culture in times of change (Schein, 1992), and e.) The prevalence of defensive routines (Argyris 1993) versus the willingness to recognize and correct mistakes (Comfort 1999).

### **2.3.3.1 Technical Infrastructure**

The organization's technical infrastructure used to seek out, exchange, and retain information provides an initial measure to evaluate a group's ability to cooperate and/or coordinate activities. Information technology and other pieces of communication equipment can facilitate a system-wide common operating picture, where interdependence and shared risk is acknowledged. The presence or absence of interoperable information technology and appropriate levels of access to information plays a critical role in determining cooperation whereas the presence or absence of key pieces of information affects the outcome of decision making (Comfort 2007). The extent to which organizations possess and use information technology, however, varies (Comfort 1999; Alberts, Garstka, and Stein 1999; Fountain 2001;



Comfort and Wukich 2009). Organizations that participate in information sharing with other agencies, whether via information technology or not, engage a potential network of partners for future endeavors.

Information technology not only facilitates communication across groups and systems, but it also offers unprecedented storage capacities that can serve as organizational memories (Fountain 2001). Personnel across organizations have opportunities to identify their vulnerabilities to risk and communicate their findings across organizational boundaries (Comfort 2007).

Well-designed communication networks facilitated by information technology go a long way in promoting cooperation (Comfort, Sungu, Johnson, and Dunn 2001; Drabek and McEntire 2002; Comfort and Kapucu 2006). Open access to information creates informational capital that facilitates the creation of a common operating picture (Comfort and Wukich 2009) and encourages appropriate levels of collective action (Fountain 2001).

### **2.3.3.2 Organizational Flexibility**

In changing, uncertain conditions, flexibility and the ability to improvise are considered important qualities (Mendonça 2007). An organization's flexibility is affected by its ability to initiate change, its patterns of formal and informal information exchange (including feedback loops), the possession of smart/best practices (Bardach 1998), and varying levels of personnel experience and training. The decision to enter into cooperative arrangements requires a certain level of organizational flexibility as cooperation requires adjustments to established practices.

#### ***Rules***

Policies, both formal and informal, affect patterns of communication and subsequent

organizational flexibility in dealing with emergent external demands (Comfort 1999). Understanding the formal, espoused policies and rules of an organization as well as the informal theories-in-use, or working rules, that facilitate action are critical in identifying the factors that facilitate and impede decision making in an organization (Argyris 1993; Ostrom 2005).

### ***Patterns of Communication***

Information exchange empowers organizations to make informed decisions regarding potential problems and helps to build system-wide consensus regarding a problem. The capacity to cooperate is enhanced significantly by the ability to seek out information, exchange it, and learn (Comfort 1999). However, once information is gathered, asymmetric information flows and asynchronous dissemination of information constrains the development of a common operating picture (Comfort 2007). In other words, actors often view problems from separate perspectives. Separate perspectives generate varying views of risk and opinions regarding the importance of cooperative activities. If actors within a system fail to reach a common understanding about a problem, cooperation is less likely to occur (Gray 1989; Comfort 2007).

Information exchange is critical to organizational learning where actors detect and correct error. Mapping the flows of information identifies who receives, or does not receive, essential information. “Channels of communication vary in the number of people they connect and in the character of the information flows they carry. Flows may be predominantly in one direction, taking the form of commands, or they may be reciprocal, involving exchanges of information among individuals” (Graber 2003, p. 17). Organizations with rigidly, asymmetric flows of information risk missing opportunities to correct error or initiate action.

Information flows to the appropriate personnel facilitate feedback organizational learning (Argyris and Schön 1995; Comfort 2007). Single-loop learning occurs when an error is detected

and behavior is altered, but the values of an organization remain the same. Double-loop learning occurs when the effects of action (products of learning) represent both a change in strategy and a change in organizational values and norms (Argyris 1993; Argyris and Schön 1995). Organizational learning is a key component to organizational flexibility.

### ***Smart Practices***

Smart practices represent the available strategies for pursuing cooperative activities. Bardach (1998) identifies several smart practices, including collocation of personnel, the adoption of shared information technology, and the practice of self-awareness exercises to encourage personnel to recognize the extent to which cooperating organizations are interdependent. Obstacles to cooperation include challenges to implementation and the vulnerability of smart practices once implemented. The disruption to current operations, the loss of reputation, and turf protectiveness, in general, make up significant obstacles to applying smart practices to the work place (Goldsmith and Eggers 2004; Bardach 1998).

### ***Experience, Education, and Training***

Experience, education, and training facilitate the intuition, cognition, and action of personnel within an organization (Klein 1993; Flin 1996). “Intuition depends on the use of experience to recognize key patterns that indicate the dynamics of the situation” (Klein 2004, p. 31). Past experience and training help to develop this type of decision making ability (Flin 1996). Exploring the experience of leaders and frontline personnel alike allows for an understanding of the role that intuition—and experience—play in decision making. Decisions to cooperate in certain situations are made by personnel whose experiences, whether positive or negative, influence their choices.

Not only does experience provide positive and negative views regarding cooperation, but it also brings different repertoires of action to draw upon when faced with a problem or opportunities to act. Organizations engage in numerous types of cooperative activities. Agranoff and McGuire (2003), for example, identify an array of nontraditional management experiences, including “seeking out policymaking information, negotiating partner arrangements, practicing interorganizational policymaking, leveraging and arranging multiple-source financing, creating financial incentives, contract management, finding and operation formal partnerships, and using and giving technical assistance of various kinds” (p. 97). Managers with diverse experiences will have more upon which to draw when faced with problems. Experience, education, and training, therefore, play key roles in determining organizational flexibility.

### **2.3.3.3 Organizational Culture and Leadership**

The organization’s culture plays a key role in determining the ability to adapt to changing conditions. The extent to which personnel value information sharing, their level of commitment to the public good, their openness to new information, their ability to lead in times of change, and the presence/absence of defensive routines (Argyris 1993) versus their willingness to recognize and correct mistakes (Comfort 1999) represent key indicators. Organizational culture and leadership can either promote or inhibit an organization’s willingness to seek out and exchange information. Regardless of an organization’s technical capacity, personnel must be willing to enter into cooperative arrangements with other organizations and organizational culture may influence this decision. This concept is explored, to some extent, above with respect to incentives.

## ***Organizational Culture***

Schein (1992) describes organizational culture as “a pattern of shared basic assumptions that the group learned as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems” (p. 12). Culture can either promote or inhibit cooperation.

Defensive routines impede the recognition of error and the identification of possible solutions (Argyris 1993). They represent a major impediment to organizational learning and effective performance (Argyris 1993; Argyris and Schön 1995). If defensive routines are pervasive, an organization’s ability to enter into new relationships may be constrained. The willingness of organizations to exchange information, their openness to new information, and their commitment to the public good offer indications of the general openness of their culture and their willingness to cooperate (Comfort 1999; Kapucu 2006). In addition to defensive routines, vulnerabilities to cooperation exist in organizational culture in terms of high turnover and the prevalence of turf protection (Bardach 1998; Kearns 2000).

## ***Organizational Leadership***

Leadership is the “ability to step outside the culture that created the leader and to start evolutionary change processes that are more adaptive” (Schein 1992, p. 2). An effective leader recognizes a problem, articulates a goal, and communicates an action strategy to solve the problem. The key to coordinate an action strategy is to communicate, in a way people understand, both an understanding of the problem and the steps thought necessary to solve it. Again, Simon’s (1997) assertion that we cannot build what we do not understand acknowledges the basic cognitive functions of recognizing a situation and creating an action strategy to deal

with it.

Exercising visible leadership offers personnel an example to be emulated. In conditions characterized by change, personnel may not recognize what organizational routines should be employed, so emulation of leadership represents a common sense alternative (Axelrod and Cohen 1999). Strong support from a leader along with material support facilitates cooperative arrangements (Kearns 2000).

### **2.3.4 Social Capital**

The ability to seek out information is also influenced by existing relationships. Social capital, i.e. the development of trust and norms of reciprocity, facilitates cooperation (Putnam 1993, 2000; Coleman 1988, 1990). The desire to establish trust, engender norms of reciprocity, and encourage future interaction is a significant factor in initiating and maintaining collective action (Axelrod 1984; Chisholm 1989). These interactions are the foundation for social capital theory (Coleman 1988; Putnam 1993, 2000).

#### **2.3.4.1 Bridging Social Capital**

Bridging social capital is emblematic of boundary spanners and policy entrepreneurs who build weak-tie relationships connecting disparate networks into larger systems (Agranoff 2007; Schneider, Teske and Mintrom 1995). Membership in a professional organization, for example, links local government officials across jurisdictions and provides potential links for future interaction (LeRoux 2006; Brown and Potoski 2003; Thurmaier and Wood 2002; Carr, LeRoux, and Shrestha 2009).

Conventional wisdom held that power, influence, and access to information emanated predominantly from close relationships existing within closely connected networks. These relationships are indeed vital to organizational operations (Krackhardt 1992). Acquaintances, or “weak ties,” however, offer access to information and resources not otherwise available in a close-knit group. Granovetter (1973) hypothesizes that weak ties form bridges to other social groups and offer access to new information otherwise unavailable.

#### **2.3.4.2 Bonding Social Capital**

Bonding social capital is characterized by tightly-clustered networks connected through strong ties. Strong ties exhibit established trust that facilitate sustained interaction (Krackhardt 1992). Multiplexity offers a useful variable in identifying strong ties. Isett and Provan (2005) explain that “multiplexity refers to the existence of multiple ties between a pair of nodes... A multiplex relationship is stronger, and thus, more likely built on a foundation of trust, than a relationship linked by only one tie” (p. 158). Local governments, for example, are able to interact with others on several issues, such as the participation in the same regional council of government, the provision of services, and/or the sharing of facilities.

The stability of cooperative relationships is improved, according to Axelrod (1984), with increased frequency of interaction. Multiplexity offers participants additional opportunities to develop trust, norms of reciprocity, and an expectation for future interaction. Feiock, Tao, and Johnson (2004), for example, find that governments that cooperate in service delivery arrangements are more likely to work together on economic development projects. Shrestha (2008) recognizes the potential of multiplexity for exploring how local governments reduce transaction costs, build trust, and encourage cooperation. “Analyzing multiple service relations simultaneously will help improve our understanding as to how the transacting jurisdictions

utilize these cross-policy nested relationships to respond to the transaction problems involved in public service provision” (Shrestha 2008, p. 121).

#### **2.3.4.3 Criticism of Social Capital**

One criticism of the prevailing notion of social capital is that while it offers a predisposition to act, social capital theorists have been unable to explain how to sustain that predisposition when actions are taken, but not acknowledged or rewarded. Social capital provides the initial condition for cooperation, but when actors defect from the cooperative agreement and trust is lost, other factors are needed to promote interaction (Axelrod 1984). When the anticipation of the future and existing levels of trust dissipate, social entropy characterizes the system and cooperation fails.

#### **2.3.5 Context**

Organizations operate within larger systems where external variables influence the options available to decision makers (Simon 1996). Several community-level attributes have been identified to represent the context in which organizations interact. Ostrom (2005) outlines a number of biophysical attributes that constrain what options are possible in a system. “The structure of the action situations is affected by a diversity of attributes that affect how rules combine with physical and material conditions to generate positive or negative incentives” (Ostrom 2005, p. 26). Attributes identified by Ostrom (2005) include the “values of behavior generally accepted in the community; the level of common understanding that potential participants share (or do not share) about the structure of particular types of action arenas; the extent of homogeneity in the preferences of those living in a community; the size and



composition of the relevant community; [and] the extent of inequality of basic assets among those affected” (Ostrom 2005, p. 26-27).

With respect to provision of local government services, for example, researchers have found that population and community characteristics represent constituent demand for cooperative arrangements (Joassart-Marcelli and Musso 2005). These attributes, such as economic status and age, may be viewed as proxies for the expectations placed on governmental officials by their constituents (Carr, LeRoux, Feiock, and Shrestha 2007; LeRoux 2006; Joassart-Marcelli and Musso 2005; Oakerson 2004; Ferris and Grady 1986; Morgan and Hirlinger 1991; Feiock 2005; Cigler 1999).

## **2.4 APPROACHES TO UNDERSTAND COMPLEX, MULTI-LEVEL SYSTEMS**

The emerging science of networks as well as Elinor Ostrom’s work on polycentric systems offer useful approaches to understand complex, multi-level systems. Several relevant concepts are explored in the sections below. They offer the present study a focus on systems that expands upon the siloed independent variables addressed in much of the existing literature.

### **2.4.1 The Science of Networks**

Social science has long relied on linear models to explain phenomena. This has constrained the boundaries of political science, public administration, and public policy with respect to the investigation of complex systems. Relatively recent work on the “science of networks” offers

valuable heuristics to explore various policy arenas, heuristics that have been in large part ignored by the fields of political science, public administration, and public policy.

In practice, complex systems “consist of diverse entities that interact in a network or contact structure...” (Page 2011, p. 25). Researchers have identified several key structural features of complex systems. Scale-free models demonstrate that some networks are dominated by hubs, and some hubs are more important to the maintenance and development of their systems than others. Scale-free networks display a distribution of connections characterized by a power-law and identify key participants that exhibit control within a system (Barabási and Albert 1999). Researchers have also identified very high levels of clustering where actors are closely connected with each other via relatively short paths (Watts and Strogatz 1998; Watts 2003; Strogatz, 2003). This so-called “small-world effect” has powerful implications to cooperation whereas this structure facilitates social influence and emergence that either promotes or inhibits cooperation.

Complex sociotechnical systems are not static. Their diversity allows them to react and change to dynamic environmental pressures. They are, therefore, adaptive. Complex adaptive systems (CAS) research explores the structure and process of large groups and reaffirms the concepts included in the sections below. Axelrod and Cohen’s (1999) model of variation, interaction, and selection, in particular, describes the basic dynamics in which collective action without hierarchy takes place.

#### **2.4.1.1 Complex Adaptive Systems (CAS)**

The factors outlined above are components of the structure and process of the complex adaptive systems in which cooperation takes place. In *Harnessing Complexity: Organizational Implications of a Scientific Frontier*, Axelrod and Cohen (1999) characterize adaptation within

complex adaptive systems as a three-step process that includes variation, interaction, and selection. Understanding the variation of agents and resources within a system, the factors that drive interaction, and most critically how agents come to select their actions ties together the factors identified in the previous sections of this chapter. The variation, interaction, and selection model helps to explain how, why, and when organizations decide to cooperate in conditions devoid of a central authority.

### ***Variation***

The adaptability and power of a complex adaptive system derives from the variety of actors within it. Adaptation requires varying perspectives and capacities to facilitate change (Axelrod and Cohen, 1999). The present study identifies heterogeneity in previous sections in terms of actors, goals, incentives, and other attributes. The heterogeneity of a system increases the possible actions available to participants (Holland 1995).

### ***Interaction***

Interaction in a complex adaptive system answers the question of what actors interact with who and when. Interactions facilitate the exchange of ideas feedback processes that are vital to learning and change (Argyris, 1993; Argyris and Schön, 1996). “When the conditions are right, the players can come to cooperate with each other through trial-and-error learning about possibilities for mutual rewards, through imitation of other successful players, or even through a blind process of selection of the more successful strategies with a weeding out of the less successful ones” (Axelrod 1984, p. 182).

## *Selection*

Variation provides strategies for innovation. Interaction diffuses these strategies and helps to create new ones. Selection represents the process of deciding what strategies to copy and what strategies to eliminate. Individuals choose what strategies to adopt and what strategies to dismiss. Regardless of the context, the choice to cooperate comes down to individual actors. The capacity to select strategies represents a key factor that leads to cooperation.

Several issues are relevant in selecting what strategies to perpetuate and what strategies to end, including: 1.) Defining criteria for success, 2.) Determining whether selection is at the level of agent or strategies, 3.) Attributing credit for success or failure, and 4.) Creating new agents or strategies (Axelrod and Cohen, 1999, p. 118-119).

### **2.4.1.2 Scale-Free Networks**

Examples of Barabási's (2009) scale-free network model follow a power-law distribution due to the existence of a few central nodes that connect with a disproportionate number of lesser-connected actors. These hubs represent critical nodes on which the system depends. Because of their centrality within the network, they possess the opportunity to exert high levels of control over other actors. Identifying the central hubs of a scale-free network represents a key step in recognizing the critical components of a system.

### **2.4.1.3 Small-World Model**

Watts and Strogatz (1998) demonstrate that certain networks are comprised of actors closely-connected through relatively short paths. If organizational networks exhibit small-world tendencies then there are implications with respect to cooperation. In highly-connected groups, actors exhibit social influence over each other. Actors take cues from the failures and successes

of others. In densely-connected networks in which actors influence each other, strategies emerge and spread without a central authority directing the action (Watts 2003).

#### **2.4.2 Institutional Analysis and Development Framework (IAD)**

The present study employs elements of Ostrom's (2005) framework to model scalable, nested sets of organizations explored in the field study area. A critical assumption in the present study is that actors in a given action situation are influenced not just by their immediate counterparts, but also by actors that exhibit control over the larger policy system at varying levels (Ostrom, 2005). One example cited above is the influence of federal and state agencies in promoting cooperation between local government agencies. According to Ostrom (2005), the position an actor assumes in a situation, the actions that they are allowed to pursue, the potential outcomes of action, the control that other actors exhibit over them, and the potential costs and benefits of initiating action shape participant expectations and subsequent actions. These factors are constrained by the nature of specific events and the attributes of the actors and the communities involved.

### **2.5 CONCLUSION**

Scholars have paid considerable attention to the problem of achieving collective action without hierarchy. The models presented above offer varying perspectives on how to explain the phenomenon and how to identify its impediments. Understanding how structural factors, i.e. available resources, rules, etc., influence decision making is useful. However, only relying on

structural factors as measured through linear methods is insufficient in identifying the factors that promote collective action. Transaction cost and social capital literature provides process-related variables on which to expand such as trust and the availability of key pieces of information. Still, the problem is not fully addressed if we neglect the multiple scales of interaction in which agencies operate. This is where Ostrom's (2005) institutional analysis and development framework as well as the emerging science of network models assist in characterizing the complex dynamic of many policy systems. Using new methods of analysis to approach the research problem, I demonstrate how organizations overcome hierarchical rigidities and develop a set of common strategies to pursue their goals.

### 3.0 RESEARCH METHODS

The present study explores the factors that influence cooperation among emergency management organizations, using a set of agencies operating in Allegheny County, Pennsylvania as a specific field study area. This system includes municipal, county, state, and federal agencies. Using a mixed methods approach, the present study employs both quantitative and qualitative methods with the assumption that together these methods offer a more effective strategy than any single method to understand the research problem (Creswell and Plano Clark 2007). I use these research methods to explore and establish a new model, a nonlinear model, to explain the policy decisions of managers to cooperate with other agencies. The limited operationalization of interorganizational cooperation in the literature necessitates an improved understanding of the available range of cooperative activities and the factors that influence whether they occur.<sup>3</sup> The interpretation of data derived from domain expert interviews provides insight as well as validation for the statistical, network, and documentary analyses described below. Network analysis clearly demonstrates the patterns of collective action that occur and provides insight to explain the phenomenon.

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<sup>3</sup> Institutional collective action literature largely focuses on formal agreements between local governments regarding the decision to produce a public good or service in-house or contract out and, generally, regress these variables against a limited set of measures (Feiock 2004).

## **3.1 FIELD STUDY AREA**

### **3.1.1 Emergency Management Networks**

Emergency management represents a classic shared problem and provides a unique area of study because of the ability of organizations to shift very quickly from routine management activities to operations in dangerous, uncertain environments, and back again. This provides an ideal area to explore the factors that influence cooperation as changing demands produced by dynamic environments create opportunities to cooperate at greater frequency than normal, administrative conditions. For further justification of emergency management as an appropriate field study area, please see Chapter 4.

### **3.1.2 Allegheny County, Pennsylvania**

The present study focuses on one field study location—Allegheny County, Pennsylvania—which is appropriate because of its size, complexity, and diversity. While it is just one county, it has a range of organizations characterized by much heterogeneity in terms of size, fiscal capacity, experience, training, exposure to risk, and the ability to reduce risk. The large number of organizations and the range of organizational characteristics allow the researcher to explore several propositions regarding cooperation. County governments generally lack the legal authority to mandate compliance from municipal agencies, which further justifies the field study area as an appropriate example for exploring collective action without hierarchy. For additional justification of Allegheny County as an appropriate location, please see Chapter 4.



## 3.2 RESEARCH QUESTIONS

The present study focuses on identifying the factors that influence interorganizational collective action without hierarchy, including components of administrative structure and process. The present study also explores a range of emergency management activities as well as public safety-oriented and traditional administrative activities to identify the types of cooperative activities that occur and the extent to which they occur.

### **What are the factors that influence interorganizational cooperation?**

- 1. What variation exists within the system in terms of vulnerability, the participants, their roles, and their organizational capacity for action?**
  - Who are the participants?
  - What are the participants' roles?
  - What is the variability in terms of the external environment, i.e. the social, physical, and built infrastructures?
  - What is the variability of the organizations' operational capacity in terms of experience, training, and technical infrastructure?
- 2. What types of cooperative activities do organizations pursue?**
- 3. To what extent do emergency management organizations cooperate or fail to do so?**
- 4. What are the existing patterns of interactions among agencies during response to small-scale to medium-scale emergency management incidents?**
  - What are the key measures of the network (degree centrality, density, distance, betweenness)?
  - What organizations appear to be influential and what are their characteristics?
  - Does the network exhibit scale-free and small-world tendencies?
- 5. What are the components of administrative structure—both espoused and in-use—that affect interorganizational cooperation?**
  - What problems and goals provide the opportunities and constraints for collective action?
  - What rules influence the decision to cooperate?
  - What incentives—both formal and informal—provide the motivation to cooperate or not to cooperate?
  - What is the role in technical infrastructure, i.e. communication and information technology, in facilitating cooperation?
  - What is the role of geographic and conceptual proximity?

- What control do actors at various levels of the system exert over other participants?
- 6. What are the components of administrative process—both espoused and in-use—that affect interorganizational cooperation?**
- What are the formal and informal patterns of communication that occur both during agency-related activity and outside of the official duties and how do they affect whether organizations cooperate?
  - To what extent do individual positions accrue influence and how does this influence affect interorganizational cooperation?
  - To what extent does organizational culture affect interorganizational cooperation?
- 7. What are the key threshold points that influence decisions to cooperate or to not cooperate?**
- What factors promote or inhibit cooperation and what are the key threshold points that influence action?
  - How do emergency managers make decisions to cooperate or fail to do so?
  - What factors are recognized at different levels of jurisdiction (municipal, county, state, and federal) and what factors are similar across jurisdictions?

### **3.3 PROPOSITIONS FROM THE LITERATURE**

The literature provides a number of propositions to explore collective action in situations without a central authority. The present study, primarily exploratory, does not focus on the empirical testing of hypotheses. Instead, the researcher concentrates on identifying propositions for future research. Propositions from the literature (outlined in Tables 1-4) provide initial guideposts against which to compare the results of semi-structured interviews.

**Table 1: Propositions from the Factors that Promote Cooperation**

<b>Concept</b>	<b>Proposition</b>
<b>Shared and/or Interrelated Problems</b>	Cooperation is more likely when organizations experience serious fiscal stress (Cigler 1999; Sonenblum, Kirlin, and Ries 1977; Joassart-Marcelli, and Musso 2005).
	Cooperation is more likely when organizations either experience serious fiscal stress or enjoy high levels of revenue (Morgan and Hirlinger 1991).
	Focusing events increases the likelihood of cooperation (Comfort 1999; Cigler 1999).
	The recognition of organizational vulnerability to various risks increases the likelihood of cooperation (Mileti 1999; Comfort 1999).
<b>Complementary Goals</b>	The desire to achieve cost savings increases the likelihood of cooperation (Sonenblum, Kirlin, and Ries 1977; Stein 1990; Hamilton 1999; Hodge 2000; Post 2004).
	The desire to improve the quality and/or effectiveness of the public goods and/or services provided increases the likelihood of cooperation (Stein 1990; Thurmaier and Wood 2002; Post 2004).
	The desire to ensure service continuity across jurisdictional boundaries increases the likelihood of cooperation (Ugboro, Obeng, and Talley 2001; Post 2004).
	Organizations lacking materials or expertise are more likely to pursue cooperative arrangements (Pfeffer and Salancik 1978).
<b>Immediate Benefit</b>	Cooperation is more likely if participants perceive the attainment of an immediate benefit as it provides justification for interaction and an incentive for future work (Axelrod 1984).
<b>Trust</b>	Cooperation is more likely when pre-established trust exists between potential partners (Axelrod 1984).
<b>Norms of Reciprocity and the "Shadow of the Future"</b>	Cooperation is more likely when potential participants desire to reciprocate for past interaction (Axelrod 1984).
	Cooperation is more likely when potential participants expect future interaction (Axelrod 1984; Ostrom and Walker 2003).
<b>Network Management Skills</b>	Cooperation is more likely when managers exhibit effective network management skills such as "big-picture thinking, coaching, mediation, negotiation, risk analysis, contract management, ability to tackle unconventional problems, strategic thinking, interpersonal communications, project and business management, and team building skills" (Goldsmith and Eggers 2004, p. 158).
<b>Proximity (Physical and Conceptual)</b>	Organizations are more likely to cooperate if they share a close physical proximity in terms of adjacency (LeRoux 2006; Feiock 2007; LeRoux and Carr 2007; Post 2004), density within a given geographic area (Ferris and Graddy 1986; Post 2004).
	Organizations that share ideas, missions, and goals are more likely to cooperate (Axelrod and Cohen 1999).

**Table 2: Propositions from the Factors that Inhibit Cooperation**

<b>Concept</b>	<b>Proposition</b>
<b>Transaction Costs</b>	Cooperation is less likely when participants perceive the transaction costs of pursuing agreements and strategies as too high.
	The ability to clearly identify asset specificity, i.e. the level of unique investment needed to produce a good or service, increases the likelihood of cooperation as organizations recognize the benefits of achieving economies of scale (Shrestha 2008; Carr et al. 2009; Brown and Potoski 2003).
	If organizations question the stability of their cooperative arrangements and/or the value of a potential long-term commitment then high asset specificity will inhibit cooperation (Feiock 2007).
	As the ability to measure a good or service produced (measurability) becomes more difficult, organizations are less likely to cooperate (Feiock 2007; Brown and Potoski 2003).
<b>Free Riding and Cost Minimizing</b>	Organizations are less likely to cooperate if they suspect potential partners to free ride or cost minimize (Olson 1965; Bardach 1998).
	Organizations are more likely to overcome fears of free riding and cost minimizing and cooperate when potential partners adhere to standards of professional performance (Romzek and Dubnick 1987).
	Organizations are more likely to overcome fears of free riding and cost minimizing and cooperate when potential partners demonstrate the need to fulfill public expectations (Behn 2001; Kearns 2011; Mulgan 2000)

**Table 3: Propositions from the Factors that Promote or Inhibit**

<b>Concept</b>	<b>Proposition</b>
<b>Incentives</b>	Cooperation is more likely when federal and/or state grants promote cooperative activities (Post 2004).
	Cooperation is less likely when laws fail to reduce liability for cooperative activities.
	Cooperation is more likely when decision makers recognize opportunities to “improve the effectiveness or productivity of a program or agency in regard to its espoused mission...” through cooperative activities (Bardach 1998, p. 32).
	Cooperation is more likely when decision makers recognize opportunities to create personal “ease, security, income, prestige, and power in the work setting” through cooperative activities (Bardach 1998, p. 32).
	Cooperation is more likely when decision makers recognize opportunities for career advancement in facilitating cooperative activities (Feiock, Steinaker, and Park 2009).
	Cooperation is more likely when decision makers recognize opportunities to “protect or enhance the [organization’s] resources” through cooperative activities (Bardach 1998, p. 32).
<b>Cognition</b>	The ability to recognize shared risk and formulate strategies for joint-action depends on experience and training (Klein 1993; 2004).
	Decision makers with positive experiences and/or training with respect to cooperation will be more likely to pursue cooperative activities.
	Organizations that value information sharing and demonstrate open communication channels will be more likely to recognize opportunities to cooperate (Comfort 1999).
<b>Capacity for Organizational Learning</b>	Organizations with technical capacity to communicate with other agencies as well as seek out and retain critical information are more likely to cooperate (Comfort 1999).
	Organizations with policies that promote information search and exchange are more likely to recognize shared risk and therefore cooperate.
	Organizations with open channels of communication are more likely to recognize cooperative opportunities either through formal or informal means.
	Organizations that promote innovation and possess smart/best practices are more likely to pursue cooperative arrangements, if it is advantageous to their operations (Bardach 1998).
	Positive past experience and training facilitate interaction and cooperation.
	Organizational culture that values the public good, information sharing, and is committed to improvement and learning increases the likelihood of cooperation.
	Leadership that recognizes the value of cooperative activities and will challenge established, organizational barriers to cooperation increases the likelihood for cooperation.

	Turf protection and suspicious organizational cultures reduce the likelihood for cooperation (Bardach 1998).
<b>Social Capital</b>	The presence of boundary spanners, i.e. bridging social capital, increases the likelihood of cooperation (Agranoff 2007).
	The presence of multiplexity strengthens trust and increases the durability of cooperative relationships, i.e. bonding social capital, thus increasing the likelihood for future interactions.

**Table 4: Propositions from the Approaches to Understand Complex, Multi-Level Systems**

<b><i>Concept</i></b>	<b><i>Propositions</i></b>
<b>Institutional Analysis and Development Framework (IAD)</b>	External actors influence whether organizations cooperate (Ostrom 2005).
<b>Scale-Free Networks</b>	Management networks may be scale-free networks, i.e. they display a power-law distribution with respect to degree centrality (Barabási and Albert 1999).
<b>Small-World Model</b>	Management networks may fit the small-world model (Watts and Strogatz 1998).

### **3.4 UNIT OF ANALYSIS**

The unit of analysis is the organization. A major goal of the present study is to characterize the opportunities and constraints faced by organizations in deciding whether to work together, including community and biophysical variables as well as varying levels of control that participants exert on one another. Several methods and data types are used to explore the multiple levels of attributes, interactions, and contexts that create the environments in which organizations cooperate.

### **3.5 METHODS**

Four types of methods will be used to explore the research questions. They include documentary analysis, statistical analysis, network analysis, and the Strauss/Corbin approach to analyzing semi-structured interviews. Table 5 outlines the present study's research questions and links them to the data, sources, and methods used.

**Table 5: Linking Research Questions with Data, Sources, and Methods**

<i>Sub-Questions</i>	<i>Data</i>	<i>Source</i>	<i>Method</i>	<i>Ch.</i>
What variation exists within the system in terms of vulnerability, the participants, their roles, and their organizational capacity for action?	Open-source documents; Social, institutional, and economic data; Semi-structured interview data	Organizational websites; U.S. Census; PA DCED; Allegheny County 9-1-1 emergency call response records; Expert interviews; Mon Valley survey, EMC Index survey	Documentary analysis; Statistical analysis; Strauss/Corbin approach	4
What other types of cooperative activities do organizations pursue?	Open-source documents; Semi-structured interview data	Organizational websites; Expert interviews	Documentary analysis; Strauss/Corbin approach	5
To what extent do emergency management organizations cooperate or fail to do so?	Survey data; Semi-structured interview data	EMC Index survey; Expert interviews	Statistical analysis; Strauss/Corbin approach	5
What are the existing patterns of interactions among agencies during response to small-scale to medium-scale emergency management incidents?	Open-source documents; Relational data; Semi-structured interview data	Allegheny County 9-1-1 emergency call response records; Expert interviews	Documentary analysis; Network analysis; Strauss/Corbin approach	6
What elements of administrative structure affect interorganizational cooperation?	Open-source documents; Social, institutional, and economic data; Semi-structured interview data	Organizational websites; U.S. Census; PA DCED; Allegheny County 9-1-1 emergency call response records; Expert interviews	Documentary analysis; Statistical analysis (ANOVA); Strauss/Corbin approach	7
What elements of administrative process affect interorganizational cooperation?	Open-source documents; Social, institutional, and economic data; Semi-structured interview data	Organizational websites; U.S. Census; PA DCED; Allegheny County 9-1-1 emergency call response records; Expert interviews	Documentary analysis; Statistical analysis; Strauss/Corbin approach	8
What are the key threshold points that influence decisions to cooperate?	Semi-structured interview data	Expert interviews	Strauss/Corbin approach	9



### **3.5.1 Documentary Analysis**

The present study analyzes open source documents available on publicly-accessible websites such as mission statements, organizational charts, operational plans, equipment levels, and maps. Documentary analysis was used to identify elements of the field study's espoused and in-use administrative structures and processes such as the system's participants, their goals, the roles they fill, their leaders, their patterns of communication, and the laws and procedures that influence cooperation.

### **3.5.2 Statistical Analysis**

Data from multiple sources were analyzed using descriptive statistics to identify the extent to which agencies interact and to evaluate the field study area's social and economic conditions in terms of variation. The present study employs analysis of variance (ANOVA) to determine variation in organizations' cooperative activities by geography and organizational discipline, i.e. fire, police, and EMS.

### **3.5.3 Social Network Analysis**

Social network analysis aids the present study in conceptualizing and measuring the existing patterns of interactions among agencies. Network data—coded from the Allegheny County 9-1-1 emergency call records—were analyzed using the social network analysis software UCINET (Borgatti, Everett and Freeman 2002) to identify several features including: 1.) The key network measures such as centrality, density, distance, and betweenness; 2.) The extent to which

organizations interact with one another on the basis of discipline and geographic location; and 3.) The unique system features such as whether the network is scale free and small world.

#### **3.5.4 Semi-structured Interviews**

I conducted and transcribed 63 interviews with emergency managers and relevant policy makers and analyzed the resulting data using Strauss and Corbin's (1990; 1998) coding process, which generated results via a three step process of open, axial, and selective coding. The method facilitated descriptions of several factors that influence cooperation and helped to validate the present study's network findings. The results identified key threshold points that prompt the decision to cooperate.

### **3.6 DATA COLLECTION AND MEASUREMENT**

The present study employs several sources of data to characterize how and why organizations decide to cooperate in systems characterized by multiple levels of government.

#### **3.6.1 Open-Source Documents**

Open source documents, found on publicly-accessible websites or obtained upon request, include mission statements, organizational charts, operational plans, equipment levels, laws and procedures, and maps. These sources enable the researcher to answer components of each research sub-question. I used documentary analysis to define categories and aggregate data

based on the identification of the system’s participants, their goals, the roles they fill, their leaders, their patterns of communication, and the rules that influence cooperation.

The websites of the Federal Emergency Management Agency (FEMA), the Pennsylvania Emergency Management Agency (PEMA), Allegheny County’s Emergency Management, the City of Pittsburgh, and other municipalities provided relevant sources. Several relevant state laws governing public safety, public health, and emergency management were analyzed to identify the formal incentives and constraints affecting collective action. Several studies—produced either by or for state agencies—offer relevant analysis on issues related to emergency management and public safety governance.

### **3.6.2 Social, Institutional, and Economic Data**

Several sources of data were identified, acquired, and cleaned to facilitate statistical analyses, including information from the U.S. Census, the Pennsylvania Department of Community and Economic Development (DCED), results from documentary analysis, and the county’s 9-1-1 emergency call records. The data will be particularly useful in outlining the initial conditions in which agencies operate, i.e. the context that constrains what actions are possible—in terms of socio-economic status, municipal-level fiscal conditions, and the existing vulnerabilities to various threats.

Individual data, compiled by the U.S. Census and aggregated to the community-level, will be used to identify socio-economic conditions and issues of vulnerability such as social, built, and biophysical. “Social vulnerability is partially the product of social inequalities—those social factors that influence or shape the susceptibility of various groups to harm and that also govern their ability to respond” (Cutter, Boruff, and Shirley 2003, p. 243). Social vulnerability

and the vulnerability of the biophysical and built environments are interrelated. “It also includes place inequalities—those characteristics of communities and the built environment, such as the level of urbanization, growth rates, and economic vitality, that contribute to the social vulnerability of places” (Cutter, Boruff, and Shirley 2003, p. 243).

Specific geographic locations and biosystems may be more vulnerable to certain threats than others (Mileti 1999). Geographic location in terms of proximity to bodies of water, seismic activity, or volcanic activities indicates a certain level of vulnerability to potential extreme events. In Allegheny County, Pennsylvania an area known for Pittsburgh’s three rivers, flooding is a particular threat. A preliminary analysis of municipal maps allowed the researcher to create statistical data, including the number of municipalities that borders rivers or other large bodies of water.<sup>4</sup>

DCED provides data on institutional-level variables for municipal police and fire departments that characterize some of the institutional components of the organizations involved. With respect to the fire discipline, data indicate whether departments are paid, volunteer, or a combination. It provides the number of fire companies per municipality and indicates whether there is a paid fire marshal. With respect to the police discipline, data indicate whether a municipality’s police service is provided in-house, contracted out, or is part of a regional

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<sup>4</sup> Populations depend on built infrastructure, which includes transportation components, utilities, and buildings in general (Johnson 2006). Road and rail networks and transmission networks span federal, state, and municipal borders and create an interconnected system upon which communities depend (Watts 2004). Understanding their vulnerability to various threats represents a shared problem that could initiate action to mitigate potential disasters. The role of built vulnerabilities in promoting cooperation will be explored in the semi-structured interviews.

department and offers relational data linking those who contract out. It also offers the total number of full-time and part-time personnel.

In addition to the fire and police information, DCED offers community-level data that reflect the economic status of municipalities. Federal and state revenue per capita offer a measure of dependence on external sources (Krueger and McGuire, 2005; LeRoux and Carr, 2007). Excess/deficit revenues over expenditures, municipal revenue/expenditure per capita, revenue per capita, and real estate tax revenues provide a characterization of municipal-level fiscal strength. Expenditures on police and fire provide information on the public levels of funding for municipal public safety activities.

Allegheny County 9-1-1 and survey data provide data regarding the number of recorded incidents related to fire, police, and EMS functions across the county. Documentary analysis of maps also provide municipalities' number of contiguous municipal neighbors, agencies' assigned 9-1-1 geographic call zone, and their council of governments.<sup>5</sup> This data may indicate levels of need for cooperation as well as the supply of potential partners available in close proximity to agencies.

### **3.6.3 Semi-structured Interview with Domain Experts Data**

Semi-structured interviews (63) were conducted using a stratified random sample of emergency managers and relevant policy makers from throughout the system. Questions were open-ended and designed to elicit the type of “thick descriptions” that describe not just the phenomenon in

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<sup>5</sup> Maps analyzed included municipal-level, council of government, and 9-1-1 call center zone maps for Allegheny County, Pennsylvania.

focus, but the context in which it occurs. The interview data identifies the elements of administrative structure and process that affect cooperation and also the key threshold points that influence the decision to cooperate.

The interviews were tape recorded, transcribed, and analyzed using the Strauss/Corbin approach with the qualitative software MAXQDA. Emergency management personnel and policy makers who work in municipal fire, police, EMS and emergency management and related county, state, and federal agencies were contacted via email and phone calls to solicit interviews. A draft of the interview protocol is located in the appendix.

**Table 6: Interviews by Level of Jurisdiction and Discipline**

<b>Level of Jurisdiction</b>	<b>Fire</b>	<b>Police</b>	<b>EMS</b>	<b>Emergency Mgmt</b>	<b>Other</b>	<b>Total</b>
Federal	N/A	N/A	N/A	2	N/A	2
State	1	2	1	4	3	11
Regional	1	1	1	N/A	2	5
County	2	1	1	2	N/A	6
Municipal	14	10	10	5	N/A	39
<b>Total</b>	<b>18</b>	<b>14</b>	<b>13</b>	<b>13</b>	<b>5</b>	<b>63</b>

The researcher conducted interviews confidentially to promote the free exchange of ideas. Criteria for selection included affiliation with an identified organization as well as senior-level management status. Municipal-level individuals, for example, were generally service chiefs, i.e. chief operating officers and chief executive officers. These individuals demonstrated day-to-day knowledge in both discipline-related operations and administrative activities. Personnel at the county, regional, state, and federal levels expressed various perspectives borne from their level of government and responsibilities within the system.

Obtaining an accurate sample of the system’s participants was a critical task in pursuing the present study’s validity and reliability discussed below. The present study’s interview sample included two federal-level agencies, the Department of Homeland Security and the Federal Emergency Management Agency. Several state agencies include the State Police, the Fire Commissioner’s Office, the Bureau of Emergency Medical Services (Department of Health), the Pennsylvania Emergency Management Agency, and the Department of Community and Economic Development.

Regionally, the Emergency Medical Services Institute (EMSI) offers an important link between state, county, and municipal resources. Councils of governments (COGs) were identified as relevant actors. At the county-level, the Emergency Services division served as an area of focus in the interview sample. The county police also provided a key agency. At the municipal-level, fire and police departments, EMS units, and emergency management coordinators provided vital frontline experience to the present study.

On the municipal level, both paid and volunteer fire departments<sup>6</sup> were represented in the interview sample as well as multi-municipal and single-municipal police departments.<sup>7</sup> EMS units include paid, public agencies; combination (paid and volunteer) public agencies; nonprofit organizations; and for-profit enterprises. Only for-profit EMS entities are unrepresented in the present study as none consented to an interview.

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<sup>6</sup> Of the 207 fire departments participating in the network, 190 are all volunteer, 14 are a combination of paid and volunteer, and 3 are fully paid.

<sup>7</sup> Of the 91 police departments, 80 are municipal-based departments that primarily administer to their municipality only, 10 are municipal-based departments that cover their municipality as well as contract out to other municipalities, and 1 (Northern Regional) is a regional department.

### 3.6.4 Survey Data

Data is analyzed from a survey administered for the present study entitled the “Emergency Management Cooperation Index” (EMC Index). Based on the National Fire Protection Association’s “NFPA 1600,” which identifies criteria for evaluating emergency management agencies, the survey was administered to 37 managers, based on the stratified sample strategy also used to sample domain experts.<sup>8</sup> The results determine the extent to which agencies cooperate during a number of activities. The researcher administered the survey to agencies that engaged in an array of both operational and administrative activities. These criteria excluded several county, state, and federal agencies whose duties focused primarily on administrative work.

The NFPA 1600 lists a number of activities intended to increase the effectiveness of emergency management agencies. These activities are often collaborative in nature and can be both formal and informal.<sup>9</sup> The addition of mutual aid—both received and rendered—to the list of outlined NFPA 1600 activities offers the index another indicator of actual agency practice as does the addition of the extent to which financial aid is given and financial aid is requested. The EMC Index measures the frequency and extent to which agencies cooperate during these

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<sup>8</sup> The NFPA 1600 represents the standard throughout the emergency management community as an evaluative tool (Waugh and Streib 2006; Lindell and Perry 2007; National Commission on Terrorist Attacks upon the United States 2004).

<sup>9</sup> Activities include risk assessment, incident prevention, mitigation activities, mutual aid planning/resource management, incident management procedures, communication interoperability testing, operations and procedures, training, evaluation and corrective actions, finance and administration, and the actual practice of mutual aid both received and rendered (National Fire Protection Association 2007; Lindell and Perry 2007).



activities and uses an additive scale to measure the extent to which agencies interact with others both inside and outside of their level of jurisdictions and disciplines.

### **3.6.5 Network Data**

A collection of Allegheny County 9-1-1 emergency dispatch records represent empirical data that document patterns of interaction among emergency management agencies, i.e. fire, police, and EMS during the response to emergency calls. No publication identified by the present study has analyzed this type of data.<sup>10</sup> Entered into a tracking system by call center dispatchers, the data include incident type, time, date, location, the type of apparatus dispatched, and all emergency management agencies that agree to dispatch to the incident.<sup>11</sup> Call data over seven months (July, August, November, and December of 2007, and March, April and May of 2008) were analyzed using the social network analysis software UCINET (Borgatti, Everett and Freeman, 2002).

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<sup>10</sup> Andrew (2006) studies formal cooperative agreements signed between Florida municipalities with respect to public safety and emergency management activities, but no one identified by the present study analyzes the actual network of interactions during response to 9-1-1 emergency incidents.

<sup>11</sup> In Allegheny County, a 9-1-1 call center receives the vast majority of emergency phone calls. Upon receipt of a call, a dispatcher asks for incident type and location, which allows the dispatcher to determine the appropriate emergency management agency to assign as the primary responder. Based on incident severity and operational need, the dispatcher may also reach out to other agencies listed on “run cards” that outline potential mutual and automatic aid partners based on proximity, past interaction, and special equipment and skills. Agencies fill out “run cards” ahead of time, listing the agencies they are willing to support. In addition to “run cards” as a determinant of selection, emergency management personnel on the scene may also request specific agency assistance. Agencies that are requested decide whether to respond or to stand down.

The data required formatting and cleaning to conduct analysis. First, the recording system uses several organizational identifiers, based on agency equipment and their location, to represent each agency.<sup>12</sup> Second, in the original EXCEL spreadsheet format, responding agencies were listed by date, time, and address, but not in a format conducive to network analysis. We used the network analysis software ORA to create relational data by linking agencies that responded to the same address, at the same time, on the same date. Under the Incident Command System (ICS), emergency management agencies operate under a unified chain of command. Cooperation, of varying intensity, is assumed if agencies respond to the same incident as they each are folded under a formal chain of command once they arrive on a scene. The resulting network matrices included the interactions between all responding agencies (the meta-network) and the sub-networks based on discipline, i.e. individual fire, police, and EMS networks.

### **3.7 THREATS TO VALIDITY AND RELIABILITY**

In a mixed-methods design, threats to validity and reliability exist at various levels. The present study does not employ statistical methods to test causal hypotheses with the exception of the limited use of analysis of variance (ANOVA) tests. Instead, it focuses on gaining an improved understanding of interorganizational cooperation and identifying propositions for future research.

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<sup>12</sup> My colleague, Steve Scheinert, designed a “find and replace” program using the statistical software program STATA in which we aggregated the thousands of acronyms into the appropriate agency identifiers. I am grateful for his contribution.

With the exception of the ANOVA models employed to measure the variance in cooperation by geography and discipline, internal validity and statistical conclusion validity are generally immaterial to the present study.<sup>13</sup> Threats to construct validity, external validity, and reliability are relevant and addressed below in detail.

### **3.7.1 Construct Validity**

Appropriately defining key constructs and operationalizing them through suitable measurements are critical tasks in ensuring the validity of this dissertation (Shaddish, Cook, and Campbell 2002). Construct validity is the extent to which a study's measures reflect the intended concepts. Several threats to ensuring the "correspondence of measure and meaning" (Innes 1990, p. 4) were considered and addressed in order to mitigate threats to validity.

#### **3.7.1.1 Construct Validity—Survey Data**

Achieving construct validity necessitates that measures adequately capture the types of cooperative activity that the present study attempts to characterize. The construct validity of the EMC Index rests in both the recognition of the NFPA 1600 as a comprehensive evaluation tool (Waugh and Streib 2006), the addition of other governance related activities, and the assumption that higher frequencies of interaction builds interorganizational cooperative capacity through

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<sup>13</sup> The use of ANOVA to assess variance in the degree centrality statistic violates the technique's assumption of independence of observations. In this case, statistical conclusion validity also depends on the reliability of the degree centrality statistic as a proxy for cooperation.

information exchange and organizational learning as a means to facilitate continued collective action (Comfort 1999).

Beyond achieving an adequate description and measure of cooperation (Cronbach and Meehl 1955), the researcher is mindful of other threats to construct validity. By including indicators to gauge interaction across an array of mitigation, preparedness, response, recovery, and governance activities, the researcher hopes to avoid mono-operation bias. By employing multiple methods of measurement, i.e. the survey and the county 9-1-1 data, the present study also attempts to avoid a mono-method bias or the reliance on one method (Shadish, Cook, and Campbell 2002). The researcher was also cognizant of experimenter expectancy bias and sought to avoid any indication of “pro-cooperation” expectations while administering the EMC Index survey.<sup>14</sup>

### **3.7.1.2 Construct Validity—Semi-structured Interviews**

In the Strauss/Corbin approach, constructs are generated by the subjects themselves and identified through the coding process. The goal of validating the resulting constructs was

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<sup>14</sup> To test construct validity in future explanatory research, the researcher would use the concept of convergent validity, i.e. the assumption that the variable in question and a variable representing a similar concept will correlate if they are accurate measures of the concept (Campbell and Fiske 1959). The researcher would compare the results of the EMC Index with the network centrality statistics using a t-test. If the two measures correlate statistically, the researcher would assume that there is a certain degree of convergent validity, thus, to some extent, a degree of construct validity. Campbell and Fiske’s (1959) multitrait-multimethod matrix approach to testing construct validity also includes the concept of divergent validity where the researcher compares a test variable and its theoretical opposite with the assumption that a valid measure would not correlate with its opposite. Whereas data were limited, the present study did not acquire an appropriate measure to test divergent validity.

pursued in two ways. The researcher compared the initial propositions offered in Chapter 2 and the phenomenon described in the data. A disconnection between the initial propositions and the data draw attention to potentially invalid constructs and conclusions. The present study identifies the conflict between certain propositions and the interview responses, generally, as holes in the literature to be explored further. The researcher also explored the results of previous interviews with other respondents during the data collection process to elicit reaction and further evaluation, as advised by Corbin and Strauss (2008).

### **3.7.1.3 Construct Validity—Network Data**

The present study pursued construct validity by using official 9-1-1 dispatch records, which offer a consistent reporting of interaction during response to emergency calls. The network degree centrality statistic (the total number of agencies with which an agency interacts), for example, is a measure of cooperation. The researcher assumes that the higher the centrality statistic, the more active an agency participates in cooperative activities. Whether the construct is valid depends on the degree to which agencies actually interact during response operations to 9-1-1 dispatch calls.<sup>15</sup>

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<sup>15</sup> Again, the present study could test construct validity by conducting convergent validity testing, as described above.

### **3.7.2 External Validity**

The extent to which the present study's conclusions will hold across different field study areas represents its external validity. External validity is limited due to the small sample size of the test area, one county. The limited size of the EMC Index, 37 respondents, also constrains generalizability, but offers a baseline assessment to compare against future research. Furthermore, the ability to replicate our design, made possible by detailed notes, helps to promote further testing and exploration (Kvale 1996; King, Kehane, and Verba 1994), which will test external validity.

The field study area's limited vulnerability to several threats that other areas experience, such as hurricanes and earthquakes, as well as the general lack of variance with respect to state laws and regulations limit external validity. The recognition of shared risk inherent in northern California or southern Florida, for example, may not exist in Allegheny County, Pennsylvania or other areas not vulnerable to major threats. Variability in this concept and other key constructs is needed to ensure external validity. Conversely, though, with over 300 organizations analyzed, several attributes such as fiscal status, social vulnerability, and organizational flexibility are explored with some confidence.

### **3.7.3 Reliability**

Reliability—in general—refers to the “consistency and stability” of the measuring instruments, i.e. whether they are dependable and replicable across field studies. “A highly reliable measure... tells us that it is measuring something precisely or consistently” (Kerlinger and Lee

2000, p. 643). To ensure the dependability of results, the present study focuses on the points outlined below.

### **3.7.3.1 Reliability—Survey Data**

The present study's stratified sampling design strengthens the reliability of the data by working to maximize systematic variance. Face-to-face interviews were the only method of survey data collection. This type of interview is considered to be the most reliable method of data gathering with respect to survey research (Kerlinger and Lee 2000). Advantages include a high percentage of returns, a high degree of validity with respect to the information gathered, and the potential to collect additional information through semi-structured interviews (Miller and Salkind 2002).<sup>16</sup> The researcher repeated standard, uniform instructions while administering the survey to reduce measurement errors and minimize error variance (Kerlinger and Lee 2000).

### **3.7.3.2 Reliability—Semi-structured Interviews**

The grounded theory method as outlined in Strauss and Corbin (1998) offers a replicable process that is recorded throughout the research process. The categorization of concepts is tied to a clear and accurate transcription of the interview, which the researcher achieved by transcribing each interview verbatim. The reliability of the responses is aided by carefully worded, open-ended questions intended to derive a valid, straightforward account from the participants. Again,

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<sup>16</sup> To ensure a high response rate, the researcher explained to potential participants how the survey was relevant to emergency managers through introductory emails and telephone calls (Miller and Salkind 2002, p. 305).

the stratified sampling design strengthens the reliability of the data, which will help to maximize the variance of experience and opinion represented.

### **3.7.3.3 Reliability—Social Network Analysis**

With respect to reliability, the 9-1-1 dispatch records represent empirical data that capture the real-world patterns of interaction between agencies recorded as regular procedure during official public business. Reliability refers to the “consistency and stability” of the measuring instruments. The researcher argues that the reliability of the 9-1-1 data is strong as trained professional dispatchers, as a part of administrative procedure, record the agencies dispatched on each emergency call. Many social network analysis studies rely on participant recollection of past interactions (Hanneman and Riddle 2005; Wasserman and Faust 1994). Whereas the 9-1-1 data is compiled in real-time through established procedures by trained professionals, the researcher is confident in the reliability of the data.

## **3.8 CONCLUSION**

Recognizing factors on multiple levels (the individual, the subgroup, and the system) provides key insights on interorganizational cooperation. Exploring the complexity of a system requires a mixed-methods approach that accounts for the policy arena’s scalability. In order to establish a new, nonlinear model to address the research problem, I must use particular methods that facilitate a nonlinear understanding of the phenomena. Analysis of semi-structured interviews and survey work identifies variables that influence individual decision making. Those decisions aggregate to form patterns of interaction as measured by methods of network analysis. Those



patterns of interaction create the structure of the system, which itself shapes and constrains future policy decisions regarding collective action. The present study depends on this mixed assortment of methods to move beyond the linear, stages model that scholars have emphasized for some time and create a more dynamic model to explore interorganizational cooperation.

#### **4.0 EMERGENCY MANAGEMENT AND ALLEGHENY COUNTY, PENNSYLVANIA AS AN APPROPRIATE FIELD STUDY AREA**

Emergency management, as a discipline, and Allegheny County, Pennsylvania provides an appropriate field study topic and geographic area to explore collective action without hierarchy. First, emergency management agencies participate in a wide-range of activities that vary in terms of required manpower, resources, and intensity. Second, variability in terms of emergency management agencies' roles, responsibilities, and internal capacities as well as the differing levels of urgency and stress experienced during operations offers the researcher an opportunity to study interorganizational cooperation in a number of settings. Third, the prevalence of asymmetry of information (where certain actors possess more information than others) and the variability in management skills demonstrated in various situations reveal additional points of interest relevant to the research problem. Fourth, with respect to the field study area, Allegheny County's large nested set of actors and the region's diverse socio-economic, built, and geophysical systems offer variability that increases the research design's ability to identify factors that influence cooperation. In all, the variability of organizational missions, the capacity to act, and the demands of the external environment necessitate varying strategies for action across the system.

## 4.1 MISSION OF EMERGENCY MANAGEMENT

Emergency management is a collection of disciplines that seek to protect life and property from various threats, both natural and man-made. These disciplines operate within a nested set of actors layered throughout the federal system in which interorganizational cooperation is a valued and, at times, necessary action. To varying degrees, agencies involved with emergency management recognize and adopt cooperative strategies not just in the face of dynamic events (Comfort 1999; Waugh 2000), but also in regular administrative environments (Carr and LeRoux 2005; Andrew 2006).

The emergency management system is comprised of multiple and diverse disciplines whose missions, tasks, and day-to-day routines vary. Emergency management includes nonprofit, private, and public sector actors that represent jurisdictions at all levels of the federal system. Federal and state emergency management personnel represent only a relatively small subcomponent of the larger system. Primary responsibility for operations falls on local first responders—fire, police, emergency medical services (EMS), and other local actors such as emergency management coordinators, public works, and code enforcement personnel (Waugh and Tierney 2007). Operations during a response expand and scale up depending on the level of need, urgency, and stress. Organizations plan for, mitigate against, respond to, and recover from extreme events (with the exception of emergency management coordinators) while also being responsible for their other day-to-day missions and tasks, police departments (law enforcement), fire departments (fire prevention and suppression), and EMS agencies (medical care and patient transport).

The diversity of tasks and the scalability in terms of expanding the number of agencies and moving up and down (and horizontally) through a federal system of governance add

variability to the study. Also, the levels of urgency and stress involved with an incident make emergency management an appropriate field study to explore the factors that promote or inhibit cooperation.

## **4.2 SIGNIFICANCE OF EMERGENCY MANAGEMENT**

The inability of communities to coordinate effectively has grown in importance as a problem, both theoretically and practically, after Hurricane Katrina in 2005, the Haitian earthquake in 2010, the floods in Pakistan in 2010, and other recent catastrophic events. The potential effect of climate change, continued population growth in vulnerable areas, and the threat of man-made disasters represent ongoing threats (Waugh 2007). The failure to coordinate effective response to extreme events is a seemingly perpetual problem (Quarantelli 1978; Drabek 1985; Wenger and Quarantelli 1989; Schneider 1995; Comfort 1999; Waugh 2006). The recent public focus on reforms to FEMA, state, and local emergency management agencies and the continued inability to manage disasters effectively make the present study timely and relevant. Not only does the present study address the efficacy of organizational performance, but it also explores efficiency.

Emergency management begins with local first responders. Municipal governments allocate a significant portion of their budgets to fire, police, and (sometimes) EMS services (Carr and LeRoux 2005). Local public safety organizations are numerous, highly visible, and important to the lives of local citizens. Figuring out where points for possible cooperation exist affects not just performance, but potentially the agencies' fiscal bottom line. Understanding how emergency management agencies interact enables an improved understanding of an important

model of governance and identifies opportunities to increase effectiveness, efficiency, and cost savings.

### **4.3 EMERGENCY MANAGEMENT SYSTEM**

Emergency management is a multi-organizational system characterized by a nested set of actors. “It is carried out within a framework established by the federal government but must be responsive to local needs” (Edwards and Goodrich 2007, p. 53). Moreover, while command-and-control arrangements are used during response efforts, the system, generally, lacks a central authority to dictate cooperative strategies.

Within single municipalities even, public officials confront obstacles in achieving appropriate levels of coordination before, during, and after an extreme event. Coordinating a range of organizations across sectors and throughout the federal system is no simple task. Within any policy arena, there is the potential for overlapping (and at times conflicting) programs, priorities, and goals. The diversity itself represented by the system’s various actors frustrates effective cooperation. Obstacles to cooperation still exist in the forms of personality conflicts and turf protection issues. Understanding the interdependence between these actors as well as their conflicts is critical to understanding how cooperation can be more effectively facilitated.

### **4.3.1 “Managing” Emergency Management: The Tension between Chain-of-Command Strategies and the Flexibility Needed for Adaptation**

A critical challenge to emergency management agencies is creating and maintaining the ability to manage both the daily activities of public safety operations and the demands generated by extreme events. The skills required to deal with both the hierarchical and network governance responsibilities of the job vary. Adaptation to dynamic conditions represents a key factor for success. Public officials have struggled to design administrative arrangements and develop management practices that facilitate adaptation and flexibility, while retaining useful elements of command-and-control.

Emergencies disrupt regular managerial routines. Tension exists between the concepts of emergency and management (Sommers and Svava 2009). Traditional management functions are intended to make activities routine. In stable conditions, managers achieve certain levels of normalcy. Emergencies, conversely, create uncertainty and require sensemaking (Weick 1995) and improvisation (Mendonça 2007) to deal with the demands of unplanned events.

The emergency management system—in general—has yet to balance the desire to regularize management routines with the constant challenge of adjusting to dynamic conditions (Comfort 1999; 2007). In practice, efforts to regularize action through command-and-control strategies (United States Department of Homeland Security 2008) have failed to create the kind of robust flexible systems that adapt to emerging threats as hierarchical systems tend to promote asymmetries of information, which is discussed in the sections below (Comfort 2005; Comfort 2007).

### **4.3.2 Established Management Routines and Practices**

The ability to expand operations, whether through internal or external surge capacities, and the ability to manage both vertically and horizontally across levels of government and jurisdictions represent key management goals. The development of the Incident Command System (ICS) and the National Incident Management System (NIMS) as well as the maintenance of local mutual aid agreements have been designed to facilitate coordination during extreme events.

#### **4.3.2.1 ICS and NIMS**

ICS and NIMS promote command-and-control, hierarchical administrative structures to coordinate agencies during response activities. They provide a common framework by which operational control is assumed by an onsite manager who establishes a chain of command that is supported by other offsite entities if necessary. This design proves relatively strong when tested by small-scale incidents, but in the face of large-scale extreme events the design is left wanting (Buck, Trainor, and Aquirre 2006; Neal and Phillips 1995). The critical challenge is balancing the utility of command-and-control with the benefits of flexibility and adaptation to rapidly changing conditions.

#### **4.3.2.2 Mutual Aid Agreements**

Robust, effective emergency management depends on cooperation in the face of complex, uncertain events that overwhelm the capacity of the initial first responders (Waugh and Streib 2006). Both formal and informal mutual aid agreements, “the sharing of supplies, equipment, personnel, and information across political boundaries,” create a surge capacity, largely horizontal in nature (Stier and Goodman 2007, p. 62). These networks of local police,

fire, and EMS agencies change and evolve, creating dynamic forms of emergency response management and metropolitan governance (Andrew 2006, 2009; Caruson, MacManus, Kohen, and Watson 2008). Professional norms have evolved that encourage flexibility and cooperation (Waugh 2007). These professional standards do not, however, always manifest. Understanding what encourages mutual aid agreements represents a critical task of the present study.

### **4.3.3 Asymmetry of Information**

Incident command management strategies breakdown when timely, relevant information fails to reach key decision makers. Information asymmetry occurs in situations where certain actors possess more pertinent information than others, information that enables them to make more timely and appropriate decisions. Information asymmetry in emergency management creates collective action problems where actors display varying abilities to recognize shared risk and formulate strategies for action (Comfort 2005). The uneven distribution of information diminishes the ability to create a “common operating picture” so vital to emergency management. For example, Comfort and Haase (2006) find “a striking pattern of asymmetry in the communication processes among the organizations participating in response operations” in the aftermath of Hurricane Katrina (p. 339).

Shared information across jurisdictions and sectors facilitates collective action based on a flexible recognition of need. In normal situations in which individual organizations possess the capacity to plan, train, exercise, and achieve desired levels of efficiency, siloed patterns of communication are likely to exist. Siloed agencies that maintain their normal routines in the face of changing conditions leave their operations more vulnerable to disruption and failure during rapidly, evolving, dynamic events (Comfort 1999). The reality is that shared risk (Comfort



1999) and the financial constraints of governments on all levels (Carr and LeRoux 2005) make information exchange a priority. In short, threats exist and governments are unable to provide the organizational capacity needed to respond to all scenarios.

Both robust and weak patterns of information exchange exist between organizations in Allegheny County. Variability creates a useful laboratory to study how available information affects cooperation. County and regional agencies increasingly serve as a hub for the dissemination of information, including threat levels, equipment availability, etc. County 9-1-1, for example, aided by preplans plays, a significant role during response operations in dispatching manpower and other resources to an event.

While county and regional personnel work diligently to communicate to municipal-level agencies, several factors continue to promote information asymmetry. First, municipal agencies accept and process county and regional communications with varying levels of interest and attentiveness. Key pieces of information recognized by one agency are missed by others. Also, the county's central information technology system, Knowledge Center, has heretofore not been regularly accessed by municipal agencies with the exception of during infrequent large-scale exercises. It is possible, then, for organizations to possess information, post it for system consumption, but fail to communicate it systematically. Furthermore, the Pennsylvania Emergency Management Agency (PEMA) uses another system, WebEOC, which is not interoperable with Knowledge Center, thus perpetuating information asymmetry.

#### **4.3.3.1 Interoperability and the Sharing of Radio Frequencies**

Other technical problems include the lack of radio interoperability and the fragmentation of the radio frequencies used by municipal agencies. With respect to interoperability, some agencies operate on high-band radios, others on low-band. Furthermore, when agencies operate

on the same band, they generally use different channels. Operating on the same channel promotes situational awareness as neighboring agencies monitor each other's operations. In Allegheny County, local first responders are assigned frequencies by the county Department of Emergency Services. Some agencies are assigned different channels than their neighbors. Pockets of municipal self-dispatchers (or "ring down centers") also operate on separate channels. While most agencies switch channels to communicate, the lack of constant monitoring diminishes their overall situational awareness and promotes asymmetry of information as some agencies possess more information than others.

#### **4.3.3.2 Lack of Horizontal Patterns of Information Exchange**

Barriers to horizontal information exchange frustrate information exchange. The present study demonstrates that local agencies engage in tightly-clustered networks based, in part, on geographic proximity. However, outside of these "neighborhood-centered" patterns, horizontal information flows are less likely to occur. The factors frustrating information exchange between municipal agencies are explored in the present study. Horizontal asymmetry of information is significant because if agencies do not receive key information from a higher level of government, horizontal channels are not necessarily in place to disseminate information effectively throughout the system, particularly in the fire discipline.

### **4.4 VARIABILITY IN ALLEGHENY COUNTY**

Feiock (2007) contends that "economic, social, and political characteristics of community populations shape preferences for public goods and help to determine the potential gains and

transaction costs of cooperation... We expect homogeneity across jurisdictions to signal potential common interests and service preferences” (p. 54). Pockets of similar communities promote cooperation. To explore this proposition a field study area should have variability in the populations explored both in terms of socio-economic characteristics and the physical environments in which they live. The same can be said for the variability of organizations, their jurisdictions, and their capacity to operate. Variability offers the appropriate dynamic to identify pockets of similar communities.

#### **4.4.1 Population**

The total population of Allegheny County is 1,218,494, a 4.9 percent reduction from the 2000 census estimate of 1,281,665.<sup>17</sup> The City of Pittsburgh, by far the largest municipality, has a population of 312,819. Trafford Borough is the smallest with 31. According to the 2000 U.S. Census, 83.1 percent of the population is white and 12.9 percent is African American; 16.8 percent of the population is 65 years old or older which is above both the national and state averages. With respect to education, 86.3 percent of the population has earned a high school diploma, while 28.3 percent holds a bachelor’s degree of higher. These statistics indicate some variability in the population.

Population distribution varies across municipality and geographic area. Some areas possess larger municipalities than others. Eight councils of government, which organize municipal joint-purchasing programs, operate in Allegheny County largely along geographic

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<sup>17</sup> <http://quickfacts.census.gov/qfd/states/42/42003.html>

U.S. Census Bureau State and County QuickFacts Allegheny County, Pennsylvania

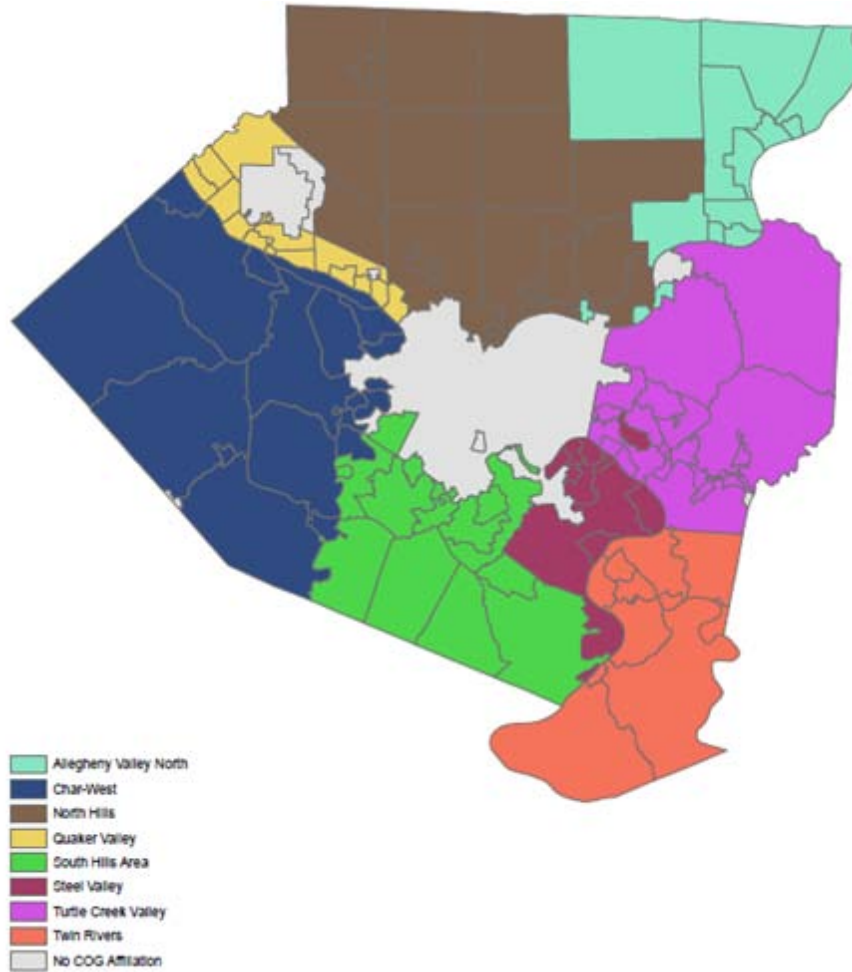
lines. Table 7 demonstrates the variability in population rates with larger communities in the North Hills and South Hills and smaller communities along the region’s river valleys (Allegheny Valley North, Quaker Valley, and Steel Valley). Figure 1 maps the location of the COGs.<sup>18</sup>

**Table 7: Average Municipal Population by Councils of Government**

	<i><b>N</b></i>	<i><b>Mean</b></i>	<i><b>SD</b></i>	<i><b>Min</b></i>	<i><b>Max</b></i>
Allegheny Valley North	15	4100.1	3263.0	1286	11563
Char-West	21	6291.0	5218.1	464	22290
North Hills	18	10619.2	9856.5	1149	32551
Quaker Valley	14	2216.8	2364.1	78	8770
South Hills Area	15	13768.4	9795.7	1225	33556
Steel Valley	9	4418.8	4004.0	565	12264
Turtle Creek Valley	20	9660.1	12000.9	727	46809
Twin Rivers	12	7445.3	8264.8	351	24040
No COG	6	56172.3	136383.4	31	334563
<i>Total</i>	130	9859.0	29910.5	31	334563

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<sup>18</sup> I want to especially thank my friend and colleague An Lewis for creating this map. Since the map’s creation, Moon Twp in the western end of the county switched to the South Hills Area Council of Government.



**Figure 1: Map of Allegheny County Councils of Government (COGs)**

#### **4.4.2 Fragmentation**

With 130 municipalities and hundreds more agencies and authorities, Rusk (2003) characterizes Allegheny County (and Southwestern Pennsylvania) as one of the most fragmented regions in the United States. The large number of municipalities offers the present study a large N, with over 520 first responder agencies either located in the county or listed as mutual aid agencies by the county 9-1-1 administration. Table 8 demonstrates the distribution of municipalities by COG. While fragmentation provides the present study with a large N, the density of

municipalities (1 for every 5.62 square miles) may not reflect the geospatial separation that exists between agencies elsewhere in the country. Regardless, fragmentation offers a laboratory in which to study collective action without central authority. Future studies can explore the role of distance in other field study areas.

**Table 8: Number of Municipalities by Council of Government**

	<b><i>N</i></b>	<b><i>%</i></b>
Allegheny Valley North	15	11.5
Char-West	21	16.2
North Hills	18	13.8
Quaker Valley	14	10.8
South Hills Area	15	11.5
Steel Valley	9	6.9
Turtle Creek Valley	20	15.4
Twin Rivers	12	9.2
No COG	6	4.6
<i>Total</i>	130	100

#### **4.4.3 Municipal Fiscal Capacity**

Municipal revenue and expenditures, particularly the revenue appropriated for public safety, represent proxies for operational ability. Municipalities in Allegheny County demonstrate a range of financial capacities. Four measures of fiscal capacity include annual municipal revenue, per capita revenue, surplus (or deficit) of revenues over expenditures, and the total police budget allocated by municipality. The heterogeneity of fiscal capacity in Allegheny County indicates that some agencies have more resources than others. With resources comes the ability to initiate and sustain action. The disparity of revenue indicates that agencies with fewer resources may call on neighbors or other levels of government when in need.

Tables 9 and 10 demonstrate that Allegheny County’s COG areas vary in terms of total municipal revenue and per capita municipal revenue. The 2006 data, from the Department of Community and Economic Development, indicate the suburban South Hills, North Hills, and Quaker Valley possess greater resources than the aging mill towns in the Steel Valley and Twin Rivers area. This indicates an increased likelihood for adequate equipment levels and staffing.

**Table 9: Total Municipal Revenue by Council of Government**

	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>
Allegheny Valley North	14	2856709.2	1910355.7	679628	6907854
Char-West	21	6145828.4	5664516.7	545022	24187208
North Hills	18	9128109.7	7364498.3	525584	23640820
Quaker Valley	14	2745077.4	2785552.5	28822	9071337
South Hills Area	15	13147280.5	10910144.6	1242753	42776016
Steel Valley	9	3170141.0	2678166.8	175775	8181230
Turtle Creek Valley	19	7262571.0	10061468.1	491311	41066338
Twin Rivers	10	6351629.2	9171106.9	195814	28971635
No COG	3	852051.0	866356.4	306739	1851033
Total	123	6517033.8	7786209.1	28822	42776016

**Table 10: Municipal Revenue Per Capita by Council of Government**

	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>
Allegheny Valley North	14	811.62	425.061	271	1815
Char-West	21	1077.4	526.115	488	2416
North Hills	18	949.33	518.748	457	2763
Quaker Valley	14	1488.04	1776.051	370	7363
South Hills Area	15	969.05	249.279	628	1386
Steel Valley	9	713.16	329.625	311	1342
Turtle Creek Valley	19	699.94	236.9	404	1253
Twin Rivers	10	589.46	233.416	405	1205
No COG	3	1093.47	692.45	611	1887
Total	123	937.7	731.985	271	7363

Table 11 reports the fiscal strength of municipalities in terms of surplus (or deficit) of revenues over expenditures. A significant portion of the county’s municipalities, 53 (40.8 percent), operate in the red. Fiscal problems exist in urban, suburban, and exurban areas. Municipalities in Allegheny Valley North, Quaker Valley, and Turtle Creek Valley average budget deficits. The City of Pittsburgh and several other municipalities receive state support to prevent bankruptcy under Pennsylvania’s Act 47 program.

**Table 11: Annual Municipal Budget Surplus (or Deficit) by Council of Government**

	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>
Allegheny Valley North	14	-716.6	371236.2	-886390	609555
Char-West	21	189695.1	850701.1	-1005399	3435428
North Hills	18	635808.1	2777873.6	-3358314	10745352
Quaker Valley	14	-10718.3	399787.8	-785449	955678
South Hills Area	15	392368.3	1554827.7	-2649518	4453971
Steel Valley	9	17280.1	363451.0	-394981	845798
Turtle Creek Valley	19	-513380.2	1920032.4	-7956251	517235
Twin Rivers	10	94403.0	801584.2	-1763416	1504088
No COG	3	-27958.0	50243.3	-71484	27024
<i>Total</i>	123	100935.2	1489757.0	-7956251	10745352

Table 12 presents the distribution of municipal police expenditures by COG. Two municipalities, Glenfield and Haysville, use the state police as their primary police protection and pay little to nothing for the service. Several municipalities invest considerable amounts on their police services. With resources comes increased operational capacity. The suburban areas along the northern river valleys, less populated areas, show relatively low expenditures. The South Hills area shows by far the largest average expenditure per municipality (\$2,302,640).



**Table 12: Municipal Expenditures on Police by Council of Government**

	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>
Allegheny Valley North	14	499086	329957	165549	1189066
Char-West	21	1100031	1012011	51188	4189639
North Hills	18	1363907	1152905	131687	4712246
Quaker Valley	13	426391	372183	31672	1181238
South Hills Area	15	2302640	1715258	210037	6414744
Steel Valley	9	737512	629722	46668	1959158
Turtle Creek Valley	19	1592167	2237436	42015	8554272
Twin Rivers	10	1197195	1535799	13560	3970841
No COG	3	256495	340898	49796	649961
<i>Total</i>	122	1183206	1417605	13560	8554272

#### **4.4.4 Vulnerability and Threats**

Vulnerability to various threats, both man-made and natural, creates common cause for action. Agencies face (and recognize) different threats and vulnerabilities at varying degrees based on the context of their situations. Variability of threats and vulnerability pose barriers to collective action as agencies recognize different goals and priorities at different times. Within its 730.17 square miles, Allegheny County demonstrates variability in terms of vulnerabilities and threats, but it also maintains pockets that share common characteristics. Allegheny County, therefore, represents an appropriate case study area to explore collective action without central authority. The section below identifies the variability of three types of vulnerability: social, built, and geophysical (and the types of threats involved).

##### **4.4.4.1 Social Vulnerability**

Cutter, Boruff, and Shirley (2003) provide a set of metrics to quantify social vulnerability and a population's capacity to return to normal living conditions following an extreme event.

Lack of access to resources and the percentage of at-risk populations (based on age and socio-economic standing) serve as appropriate measures. The recognition of social vulnerability motivate planning and preparation for action in the face of hazards (Gazley, Brudney, and Schneck 2009). Conversely, the lack of recognition creates barriers to collective action (Comfort 1999).

The 2009 U.S. Census estimates that 12.4 percent of county residents live below the poverty line. An inspection of the same poverty statistic (for 2000) by municipality identifies pockets of vulnerable communities, notably in the City of Pittsburgh, the Mon Valley (a set of municipalities along the Monongahela River), and other aging-river towns suffering still from the collapse of the steel industry. Table 13 presents the geographic distribution of poverty rates by council of government, which reaffirms the differences between urban, suburban, and exurban areas.

**Table 13: Average Poverty Rate by Council of Government**

	<i>N</i>	<i>Mean %</i>	<i>SD</i>
Allegheny Valley North	15	8.1%	0.033
Char-West	21	7.1%	0.051
North Hills	18	8.1%	0.038
Quaker Valley	14	7.5%	0.046
South Hills Area	15	6.5%	0.041
Steel Valley	9	17.9%	0.078
Turtle Creek Valley	20	14.1%	0.107
Twin Rivers	12	10.8%	0.048
No COG	6	23.0%	0.386
<i>Total</i>	130	12.4	-

Table 14 reports per capita income averaged across geographic areas, which reaffirms the variance in social vulnerability as demonstrated in Table 13. Suburban areas appear to be more affluent, while the river valley communities earn considerably less on average.

**Table 14: Per Capita Income by Council of Government**

	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>
Allegheny Valley North	14	811.62	425.061	271	1815
Char-West	21	1077.4	526.115	488	2416
North Hills	18	949.33	518.748	457	2763
Quaker Valley	14	1488.04	1776.051	370	7363
South Hills Area	15	969.05	249.279	628	1386
Steel Valley	9	713.16	329.625	311	1342
Turtle Creek Valley	19	699.94	236.9	404	1253
Twin Rivers	10	589.46	233.416	405	1205
No COG	3	1093.47	692.45	611	1887
<i>Total</i>	123	937.7	731.985	271	7363

#### **4.4.4.2 Built Vulnerability**

The built environment consists of “the infrastructure on which the population relies for normal day to day life” (Johnson 2006, p. 68). It represents the “human-made environment and technology—public utilities, transportation systems, communications, critical facilities, engineered structures, and housing” (Mileti 1999, p. 128). The built environment represents society’s critical infrastructure necessary to maintain basic services. Code enforcement efforts mitigate the vulnerability of new construction in some hazardous areas. Many constructed systems, however, remain susceptible to extreme events or decay due to subpar building materials, inadequate maintenance, and poor code enforcement (Caruson and MacManus 2008). One fire chief, Respondent 13, confirms the vulnerability of older neighborhoods where “building construction and materials are old.” He indicated that “there are a lot of abandoned structures in that area that are subject to fires and criminal arson fires.”

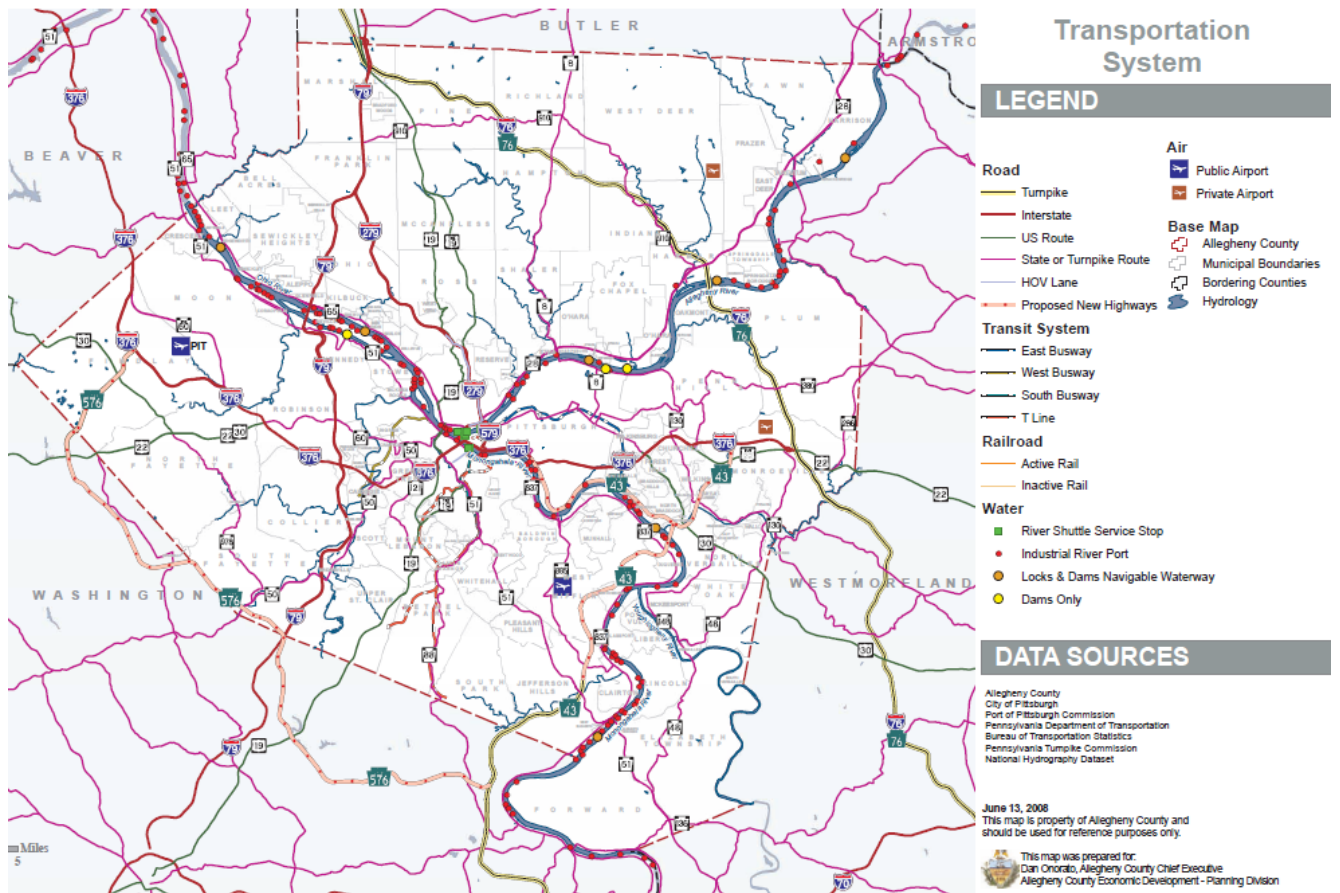
“The ability of this built environment to withstand the impacts of extreme natural forces plays a direct role in determining the number of lives lost, the number and severity of injuries,

and the financial impact of disasters” (Mileti 1999, p. 128). Vulnerability to specific elements of critical infrastructure spans municipal borders (Leavitt and Kiefer 2006). The recognition of specific built vulnerability motivates mitigation and planning activities to reduce the risk of life and property lost.

Allegheny County possesses an assortment of roads, railways, tunnels, and bridges. Utilities, such as electric transmission lines, communication towers, and gas lines, dot the county as do residential, public, and commercial buildings (Johnson 2006). Mixed land use across the county ranges from residential to commercial to industrial. Each type of development creates vulnerabilities to extreme events, including the risk of terrorism.

Allegheny County’s role as a nexus for regional and national transportation routes exposes it to traffic accidents and large-scale mass casualty events. As a pass through point for hazardous materials, Allegheny County faces a high degree of manmade risk, which increases the need for cooperation across municipal and county boundaries. Figure 2 demonstrates the overlapping transportation network. Several interstates and principal arterial roads intersect rail lines, busways, and the area’s water routes.

There is some variability in the degree of transportation infrastructure across municipalities. However, all municipalities are exposed to some level of risk. For example, state-maintained roads run through 116 of the 130 municipalities (89.2 percent). Active rail lines crisscross through 98 municipalities (75.4 percent). Major interstates run through less, only 34 (26.2 percent).



**Figure 2: Allegheny County Transportation System**

**Source: Allegheny County Economic Development - Planning Division**  
<http://www.alleghenyplaces.com/maps/ec/TransportationSystem.pdf>

Housing stock represents potential vulnerabilities to the system. Allegheny County possesses 583,646 housing units, an average of 4489.58 per municipality (median 1980.00, SD 14,499.11). Vacant housing units (46,496, mean 357.66, median 132.00, SD 1721.17) present risks in the form of potential fire and illegal squatting. Density of housing units per square mile differs across geographic areas. High density indicates a concentration of people susceptible to various risks. Low density creates problems with respect to evacuation and other response related activities. Table 15 shows that in Allegheny County, however, low density housing areas are located in certain suburban areas. It also shows high density housing areas distributed

throughout the county. Some pockets of high density housing are located in low-income, flood prone areas such as the Turtle Creek Valley.

**Table 15: Housing Units per Square Mile by Council of Government**

	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>
Allegheny Valley North	15	1569.2	1439.0	61	4767
Char-West	21	1601.5	1991.6	65	8614
North Hills	18	1079.6	1250.1	129	3932
Quaker Valley	14	1314.7	1605.8	104	4770
South Hills Area	15	2205.3	1614.6	239	5790
Steel Valley	9	1838.2	845.6	1004	3646
Turtle Creek Valley	20	2245.3	1250.6	371	4646
Twin Rivers	12	1016.1	829.5	85	2225
No COG	6	812.5	1114.2	48	2940
<i>Total</i>	130	1589.3	1479.2	48	8614

#### **4.4.4.3 Geophysical Vulnerability**

“Various parts of the country are more susceptible to specific natural disasters—the West to earthquakes, the Midwest to tornados, the South to hurricanes, and the North to blizzards” (Caruson and MacManus 2008, p. 288). Communities bear varying levels of risk based on their geophysical surroundings, i.e. the geographic features of their environment, weather patterns, etc. (Mileti 1999). Common geophysical vulnerabilities create common cause for action. Allegheny County is vulnerable to snowstorms, landslides, windstorms, and occasionally tornadoes. The county is particularly vulnerable to flooding.

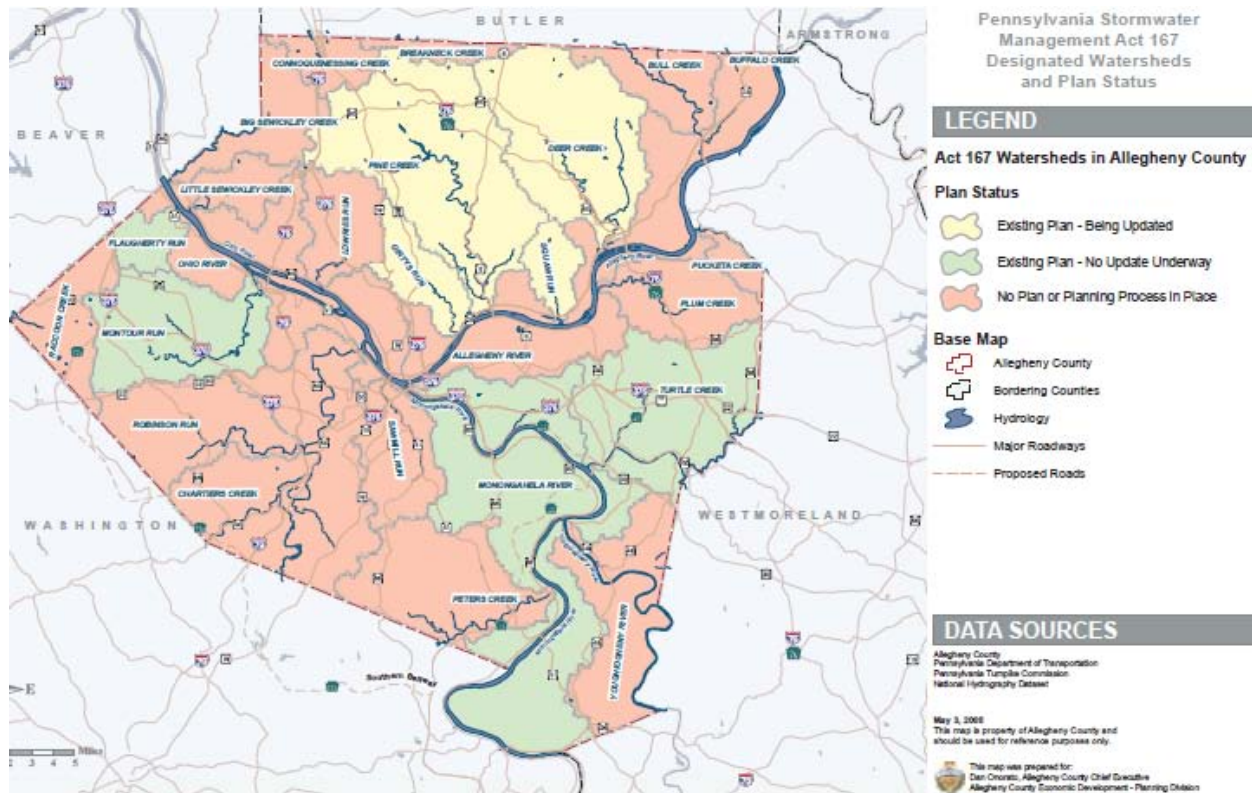
Allegheny County, where the Allegheny and Monongahela rivers form the Ohio, represents a focal point for several regional watershed systems. Municipalities are exposed to various levels of flooding risk. Each municipality in the county is part of a watershed and each municipality has some type of hydrology system passing through its borders. Major rivers, not small creeks or streams, pass through 83 of the 130 municipalities (63.8 percent). Flood risk varies across the county with 54 of the 130 municipalities (41.5 percent) located on a recognized

floodplain. Strong flooding due to Hurricane Ivan in 2004 reminded communities of their susceptibility to floods and catastrophe.

Some areas recognize and act on their mutual vulnerability to flooding whereas others do not. Figure 3 depicts Allegheny County watershed areas in which communities have in the past collaboratively planned to mitigate risk and respond to disasters.<sup>19</sup> Only one area, in the North Hills, was in the process of updating their plans in 2006. Despite the increasing risk of flooding as suburban development expands, a sizable portion of the county fails to engage in joint action, which indicates that communities either do not recognize their risk or that barriers exist, inhibiting cooperation.

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<sup>19</sup> The Pennsylvania Stormwater Management Act, or Act 167 of 1978, mandates that counties organize stormwater management plans with communities located in areas of risk.



**Figure 3: Allegheny County Designated Watersheds and Plan Status**

**Source: Allegheny County Economic Development - Planning Division**  
[http://www.alleghenyplaces.com/maps/ec/PA\\_Stormwater\\_Act\\_167.pdf](http://www.alleghenyplaces.com/maps/ec/PA_Stormwater_Act_167.pdf)

#### **4.5 VARIABILITY WITHIN ALLEGHENY COUNTY’S EMERGENCY MANAGEMENT SYSTEM**

In emergency management, roles and responsibilities are determined by the internal capacity of the agency, i.e. their mission, resources, and the ability of their personnel, as well as the demands of the external environment (including the prevalence of extreme events). Tasks range from day-to-day routines to response to high-risk, low-probability events where levels of urgency and stress as well as the demand on resources and personnel increase significantly.



National Incident Management System (NIMS) organizes agencies into a common framework to coordinate emergency support functions during extreme events. Activities include the coordination of transportation support, communications, mass care, search and rescue, and public safety and security. In total, fifteen support functions are outlined. Compared with day-to-day routines, these activities require a greater degree of cooperation and coordination with outside agencies.

Several disciplines make up the emergency management system. The present study focuses on three disciplines—fire, police, and EMS—as they bear the primary local responsibility for emergency response. These three disciplines are introduced below with a general description of their organizational structures and both their routine public safety tasks and their disaster response activities. Allegheny County represents a proxy for federal system. Other levels of government and other types of agencies are also reviewed below.

First responders exhibit varying operational capacities in terms of their exposure to risk, their experience, training, resources, technical infrastructure, and their ability to recognize risk. Comfort and Wukich (2009) demonstrate the variability of operational capacities in a set of first response agencies in the Mon Valley region of Allegheny County. One key finding is the considerable variability in the activities dedicated to reducing vulnerability to outside risk. Variability across a range of organizational indicators makes Allegheny County an appropriate field study.

Table 16 lists local, regional, and county agencies by discipline participating in the Allegheny County system as listed in the 9-1-1 records. Several agencies that border the county are included as they are listed as mutual aid agencies. Table 16 does not, however, account for the county police and the Department of Community Service's assets, public works departments,

or the 130 municipal emergency management coordinators who participate in varying degrees. Furthermore, Table 16 does not account for agencies operating at the regional (i.e. trans-county), state, or federal levels. The sections below briefly introduce these actors and demonstrate their variability in terms of missions, activities, and organizational capacity.

**Table 16: First Responder Agencies by County**

	EMS		Fire		Police		Total	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Allegheny	82	94.3	240	78.2	124	98.4	446	85.8
Armstrong	0	0	1	0.3	0	0	1	0.2
Beaver	0	0	2	0.7	0	0	2	0.4
Butler	0	0	11	3.6	0	0	11	2.1
State	0	0	0	0	2	1.6	2	0.4
Washington	2	2.3	16	5.2	0	0	18	3.5
Westmoreland	3	3.4	37	12.1	0	0	40	7.7
<i>Total</i>	87	16.7	307	59	126	24.2	520	100

#### **4.5.1 Municipal Agencies**

During disasters, local responders represent response system’s frontline and bear the primary responsibility to manage events (Kamolvej 2006; Waugh and Tierney 2007; Caruson, MacManus, Kohen, and Watson 2008). “Emergency management capacity is built from the ground up. Neighborhood and community programs have to stand on their own because assistance may not arrive for hours or days” (Waugh and Streib 2006, p. 133). In many communities, agencies are relatively small and are overwhelmed as incidents evolve from routine to extreme. First response surge capacity is bolstered during the initial response, not generally by higher levels of government, but by mutual aid agreements with neighboring local agencies.

Local first responders, because of their knowledge and proximity to their communities' physical and social vulnerabilities, are well-situated to engage in mitigation and planning activities. The ability of local first responders to learn and adapt represents a critical component to developing resilient disaster response systems (Comfort 1999; Comfort and Wukich 2009). Understanding how local agencies interact within their jurisdictions, outside of their jurisdictions, and with other levels of government is critical in recognizing how information exchange and other factors facilitate cooperation and improve performance. Studying the abilities of local responders to cooperate with each other and other actors within the system, therefore, is useful. The extant literature, however, generally focuses on federal and state level actors. The present study is designed to focus on local responders, their interaction with each other, and their interaction with other organizations within the system.

#### **4.5.1.1 Fire**

“A volunteer fire company is a nonprofit chartered corporation, association, or organization that provides fire protection or rescue services and may offer other voluntary emergency services...” (Pennsylvania General Assembly 2005, p. 6). The majority of fire departments are volunteer. Some are paid. Fire departments, both paid and volunteer, focus their daily operations on fire prevention, suppression, and search and rescue activities. Several fire departments offer emergency medical services of some kind, generally quick response or basic response services (although some maintain advanced life support units). Volunteer departments generally depend on internal fundraising activities to maintain their operations (Compton and Granito 2002), although some are supported by varying levels of municipal government support in the form of direct financial contributions, insurance payments, and fuel.

During an extreme event, fire departments provide fire suppression, mutual aid support, search and rescue, traffic control, and warning and evacuation support (Wenger and Quarantelli 1989). “Firefighting is a service that also has the properties of labor-intensity, although much less so than police patrol” (Carr and LeRoux 2005, p. 14). The “downtime” experienced by personnel allows for fire personnel to plan, train, and pursue other educational initiatives.

There is variability in fire department governance structures. Fire departments are funded by a number of sources including public and nonprofit entities. The administrative structure is often similar across municipalities in that fire chiefs oversee both operations and some administrative functions. However, in volunteer departments, executive boards (particularly the president) maintain many administrative duties. Structure and personnel used vary across municipalities. Types include volunteer, paid, and combination (paid/volunteer) departments. Predominantly, throughout the country, departments depend on volunteer labor (Wenger and Quarantelli 1989; Perkins 1990; Compton and Granito 2002).

Department size, access to resources, experience, and overall capacity vary. Of the 207 fire departments based in Allegheny County, for example, 190 (91.7 percent) are staffed only by volunteers, 14 (6.8 percent) use a combination of paid and volunteer staff, and only 3 (1.4 percent) departments are fully paid. Table 17 shows the staffing arrangements by municipality; 111 municipalities (85.4 percent) are served by all volunteer departments, 8 (6.2 percent) are protected by combination departments, 3 (2.3 percent) are served by paid departments, and 8 (6.2 percent) are served by agencies located outside of their borders.

**Table 17: Municipal Provision of Fire Service by Councils of Government**

	All Volunteer		Combination Paid/Vol		Fully Paid		None		Total	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Allegheny Valley North	15	13.5	0	0.0%	0	0	0	0	15	11.5
Char-West	19	17.1	0	0	0	0	2	25	21	16.2
North Hills	17	15.3	1	12.5	0	0	0	0	18	13.8
Quaker Valley	10	9	1	12.5	0	0	3	37.5	14	10.8
South Hills Area	12	10.8	3	37.5	0	0	0	0	15	11.5
Steel Valley	8	7.2	1	12.5	0	0	0	0	9	6.9
Turtle Creek Valley	17	15.3	2	25	1	33.3	0	0	20	15.4
Twin Rivers	11	9.9	0	0	1	33.3	0	0	12	9.2
No COG	2	1.8	0	0	1	33.3	3	37.5	6	4.6
<i>Total</i>	111	85.4	8	6.2	3	2.3	8	6.2	130	100

#### 4.5.1.2 Police

Police departments maintain labor-intensive operations aimed at protecting life and property through a number of activities including patrols, response to incidents, investigations, and coordination with other agencies within the criminal justice system. Officer training and educational programs represent additional activities conducted in support of the operations listed above.

Police also engage in disaster response duties such as planning, training, mutual-aid response, traffic control, warning and evacuation, and some search and rescue activities (Wenger and Quarantelli 1989; Andrew 2009). Their routine activities include the potential for interaction with a number of organizations including fire departments and EMS agencies, hospital emergency rooms, mental health programs, drug treatment, facilities, homeless shelters, and of

course other actors within the criminal justice system such as prosecutors, the courts, correction facilities, etc. (Geller 1991).

With respect to administration, police departments are funded and operate as public entities. The structure of police departments is comparatively similar across municipalities, although sizes and capacity change often based on size and capacity of their local populations and tax bases (Wenger and Quarantelli 1989). For example, the largest department, the City of Pittsburgh, employs 900 full-time personnel and no part-time officers. Removing Pittsburgh from the analysis, most departments are relatively small, ranging from no full-time employees (where even the chief is a part-time employee in five departments) to 52 employees. The average size of full-time staff is 11.76 (median 9.50, SD 11.32). Five departments depend entirely on part-time staff. Part-time officers are used by the majority of departments to augment their numbers and reduce salary expenditures. The average department employs 4.44 part-time officers (median 3.00, SD 5.26). Several departments do not employ part-times while Bethel Park employs 27 (just one less than their full-time total).

Of the 91 police departments, 80 are municipal-based departments that administer to their municipality only, 10 are municipal-based departments that service their municipality as well as contract out to other municipalities, and 1 (Northern Regional) is a regional department. While the one example of a regionalized department is limited to the suburban North Hills, Table 18 demonstrates the distribution of municipalities that contract out for their police service ranges across geographic and socioeconomic areas.

**Table 18: Municipal Provision of Police Services by Council of Government**

	Own Municipal Police Force		Police Service Contracted from Another Municipality		Regional Police Service		State Police Coverage Only		Total	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Allegheny Valley North	15	13.9	0	0	0	0	0	0	15	11.5
Char-West	18	16.7	3	18.8	0	0	0	0	21	16.2
North Hills	14	13	0	0	4	100	0	0	18	13.8
Quaker Valley	7	6.5	5	31.3	0	0	2	100	14	10.8
South Hills Area	15	13.9	0	0	0	0	0	0	15	11.5
Steel Valley	7	6.5	2	12.5	0	0	0	0	9	6.9
Turtle Creek Valley	17	15.7	3	18.8	0	0	0	0	20	15.4
Twin Rivers	11	10.2	1	6.3	0	0	0	0	12	9.2
No COG	4	3.7	2	12.5	0	0	0	0	6	4.6
<i>Total</i>	108	83.1	16	12.3	4	3.1	2	1.5	130	100

#### 4.5.1.3 EMS

Emergency medical services (EMS) agencies provide ambulance services and paramedics for emergency situations (Tierney 1985). Daily, routine activities include response to incidents, patient transport, and other administrative duties. During disasters, activities may include planning, training, mutual-aid response, the provision of paramedic services, and patient transport. EMS agencies coordinate operations and information sharing with other organizations within the public health system, particularly during extreme events.

EMS agencies take the form of public, nonprofit, and private organizations. Many municipalities, across the country, pay for and contract out for ambulance services (Holian 2007). Others provide in-house, publicly-financed agencies. In Allegheny County, EMS agencies include municipal authorities, municipal departments, and nonprofit organizations that derive their revenue from a combination of municipal government support, community subscriptions, private contributions, and insurance reimbursements for patient transports.

With respect to Emergency Medical Services (EMS), varying levels of operational capacity exist as well as mission imperatives. For example, there are 54 Advanced Life Support (ALS) units, 24 Quick Response Service (QRS) units, and 5 Basic Life Support (BLS) units. Some ALS agencies and all QRS do not transport patients. Some of these ALS agencies are counted multiple times if they have sub-units located in separate municipalities.

#### **4.5.1.4 Role of Other Municipal Actors**

In addition to fire, police, and EMS, many other municipal-level actors participate in emergency management. The sections below briefly introduce other municipal actors and also county, regional, state, and federal agencies involved in Allegheny County. These sections describe the range in missions, activities, and organizational capacities and resources.

##### ***Local Emergency Management Coordinators (LEMC)***

In Pennsylvania, each municipality is required by state law to appoint a local emergency management coordinator (LEMC) who annually submits written emergency operational plans to the county who in turn submits them to the state. The extent to which emergency management coordinators participate in planning, training, and response in Allegheny County varies. According to the present study's qualitative findings, some contribute considerably in terms of coordinating activities, while others have not even met key first responders in their municipalities. The range of experience and ability varies also. Local emergency management coordinators, in the county, are predominantly volunteers. Elected officials who make the appointments are limited to appointing individuals who are willing to accept the responsibilities. Other than appointing a service chief (which many municipalities do), there are few incentives available to municipalities to recruit coordinators.



### ***Public Works Departments***

Public works departments contribute a significant amount to emergency management in terms of prevention, response, and recovery activities. In Allegheny County, public works departments are involved in debris removal, road clearing, and other support functions. The Pennsylvania Department of Transportation (PennDOT), the county, and almost every municipality have public works personnel. These departments vary in terms of their resources. The February blizzard of 2010 provides an example of the extent to which emergency services (and the community at large) depend on public works to clear vital transportation routes.

### ***Building Inspection/Code Enforcement***

Each municipality offers building inspection and code enforcement services that implement various zoning regulations and building standards. The provision of these services derives from either in-house personnel or contracting out (from other municipalities or for-profit entities). These actors play a vital role in implementing prevention and mitigation initiatives, including fire and flood prevention programs. However, the extent to which municipalities adopt and implement prevention and mitigation initiatives varies. The extent to which these personnel interact with emergency service agencies also varies, according to the analysis of semi-structured interviews.

### ***Municipal Managers and Elected Officials***

Municipal managers and elected officials establish and implement policies related to emergency management and prioritize activities through the budgeting process. They play an important role as connectors with state agencies such as the Department of Community and

Economic Affairs. The extent to which municipal managers and elected officials are involved with their public safety agencies vary.

## **4.5.2 County Agencies**

Two main departments influence the emergency management system at the county level: The Department of Emergency Services and the county police. These county agencies disseminate information regarding threats and provide support to municipal agencies. Both operations are diverse in terms of the number of activities in which they engage. Both possess considerable resources. Both are described below.

### **4.5.2.1 The Department of Emergency Services**

Waugh (1994) argues that county governments possess the potential to serve as regional emergency management agencies, supporting local municipal agencies. County governments' geographic proximity to local agencies, their large-resource base, and their ties to state agencies facilitate the coordination of various activities (Waugh 1994). Allegheny County supports Waugh's (1994) argument, particularly the work of the Department of Emergency Services, which is divided into five operational divisions: 9-1-1 operations, the county fire academy, fire investigation, the EMS division, and emergency management support and HAZMAT operations.

#### ***9-1-1 Center***

Within the past decade, Allegheny County consolidated tens of municipal-based emergency dispatch centers into one, central call center. The 9-1-1 call center dispatches emergency services based on the nature of calls and the need of the situation. They also dispatch

mutual aid and additional support as requested by first responders on the scene of an incident. Currently, the county is divided into four call zones: North, East, South, and Central. Four municipalities, which border neighboring counties, are dispatched by those counties' 9-1-1 systems. These county 9-1-1 systems work together (and with their emergency management coordinators) to coordinate dispatching in the event of an incident that requires a multiple-county response. While county 9-1-1 consolidated several ring down centers over the past decade, a handful of communities continue to self dispatch. A few border municipalities are dispatched by Beaver and Washington Counties.

### ***Fire Academy***

The fire academy facilitates training at the county level. The academy provides baseline certification training for firefighters. They also offer advanced level courses in both operations and leadership skills. The fire academy coordinates their curriculum with the State Fire Commissioner's office and works with the Community College of Allegheny County to administer their courses.<sup>20</sup>

### ***Fire Marshal's Office***

The fire marshal's office investigates the cause of structural fires throughout the county. Determining the origins of a fire has ramification on law enforcement activities and insurance payments. The fire marshal's office spans municipal borders to provide a necessary service.

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<sup>20</sup> The Community College of Allegheny County and the University of Pittsburgh's Center for Emergency Medicine provide training for EMS agencies in the county.

### ***The Division of Emergency Medical Services***

The Division of Emergency Medical Services coordinates resources for EMS agencies and facilitates meetings and operations of the Allegheny County EMS Council, “a not-for-profit corporation that represents the prehospital care community with issues of recruitment, retention, reimbursement, recognition and response” (Allegheny County Emergency Services 2010a). Personnel in this section are boundary spanners. They coordinate training exercises and planning. They serve as the direct link between the EMS community and the county personnel. They also promote quality control between EMS agencies and the 9-1-1 center.

### ***Emergency Management and HAZMAT Teams***

The Department of Emergency Services contributes directly to municipal response operations. Pennsylvania Code Title 35 mandates that local municipalities retain operational control during an incident. While the county will not take control of an incident scene, personnel will help to coordinate the acquisition of resources and personnel. The county owns equipment and facilitates interagency sharing. Equipment owned by the county is used during emergency incidents and includes rescue, technical rescue, fire suppression, and HAZMAT response equipment. Five county-coordinated HAZMAT teams respond to hazardous material incidents (four suburban teams and one team for Pittsburgh). They provide a specialized service to municipalities overwhelmed by a HAZMAT incident.

#### **4.5.2.2 County Police**

County police perform basic law enforcement activities on county property (airports, parks, etc.). More germane for the present study, many of their 240 officers and 50 civilian employees provide support to local municipalities and other criminal justice agencies in the form

of detective work regarding homicide, narcotics, and general investigations (Allegheny County Police 2010). County police offer local police departments significant support in terms of experienced personnel and specialized services.

### **4.5.3 Regional Agencies**

Two types of regional entities exist in the Allegheny County system. The first type of regional agency spans county borders. The second type is geographically smaller, spanning across municipalities, but seldom counties. These regional entities, county and municipal boundary spanners, serve several purposes, but the common theme here is that regional entities cross jurisdictions to disseminate information or coordinate some type of multi-agency task.

#### ***County Boundary Spanners***

The PA Region 13 Task Force is comprised of 13 counties and the City of Pittsburgh. Figure 4 identifies Pennsylvania's counterterrorism task forces. The primary focus of Region 13 is to coordinate planning, training, and response operations across jurisdictional borders. Shared resources and expertise facilitate operational activities on a regular basis. Analysis of semi-structured interviews indicate that agencies recognize Region 13 as a unifying, coordinating entity with specific respect to resource management and to a lesser extent the provision of large-scale training exercises. Region 13 is one of nine anti-terrorism task forces in the Commonwealth of Pennsylvania. Respondent 58 differentiated Region 13 from similar entities:

There are two models of task forces. Some are more administrative task forces. They get together. They purchase equipment. They have mutual agreements. They share their things that way. They do planning regional in. Other task forces are becoming more operational. They actually respond to regional incidents and may have more of an operational element to them. Region 13 is very operational.

# REGIONAL TASK FORCES and PEMA AREAS

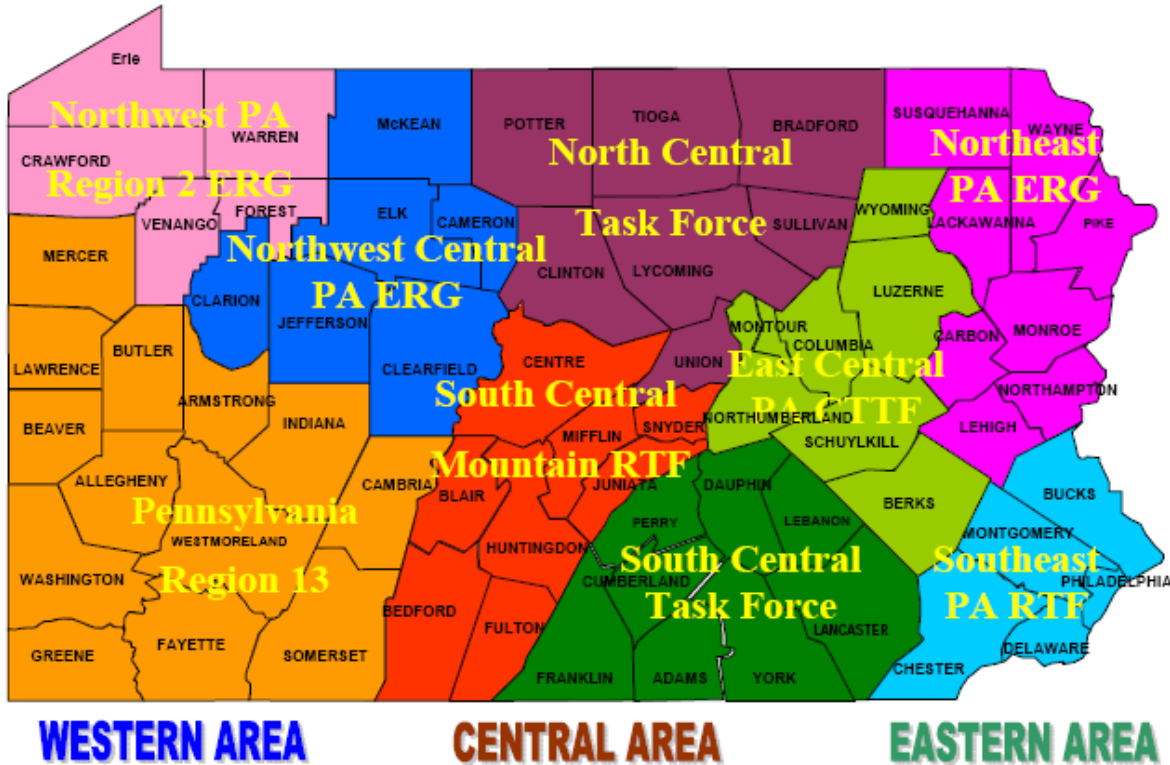


Figure 4: Pennsylvania's Regional Task Forces and PEMA Areas (Source: PA SEOP, BP-24)

The Emergency Medical Services Institute (EMSI) encompasses much of the same area as Region 13 and serves as an administrative and operational entity for the Pennsylvania Department of Health’s Bureau of EMS. EMSI inspects ambulance services for licensure, is responsible for personnel accreditation, and reviews quality assurance procedures in the region. The agency also coordinates large-scale training exercises as well as a regional strike team to be deployed during extreme events. “We rely on EMSI to put on those exercises because we just don’t have the resources to do it” (Respondent 32).

### ***Municipal Boundary Spanners***

Smaller regional entities cross municipal borders, but seldom county borders. Councils of governments (COGs), chief associations, and the Allegheny County EMS Council are primary examples. COGs, particularly the South Hills Area Council of Government (SHACOG) with respect to public safety agencies, serve as a coordinating entity for joint purchasing. The North Hills Council of Governments (NHCOG) provides a forum to create and maintain region-wide mutual aid agreements. Chief associations and professional organizations like the county police chief association and the county EMS council provide forums for networking, discussing best practices, and coordinating training exercises.

#### **4.5.4 Federal and State Agencies**

State and federal agencies play a role in the local emergency management system. The federal government through the Department of Homeland Security (and the Federal Emergency Management Agency) distributes grants for anti-terrorism and hazard prevention initiatives. The FEMA Fire Grant program bolsters the operational capacity for fire departments and some EMS agencies.

State legislators (through their discretionary grants), the Pennsylvania Emergency Management Association (PEMA), and the Bureau of EMS also enhance agency operational capacity through their grants programs. The State Fire Commissioner oversees the State Fire Academy whose curriculum and instructors are available across the Commonwealth. And the Bureau of EMS exhibits certain regulatory control of EMS agencies as they license agencies and certify personnel.

The Department of Community and Economic Development devote personnel and resources to improve the efficiency of administrative operations within first response agencies. They develop regional police and fire studies and share the information with municipalities. They will attempt to mediate relevant merger negotiations with interested agencies through a detailed strategy of community involvement.

#### **4.6 CONCLUSION**

In terms of exploring collective action in the absence of hierarchy, emergency management as a discipline and Allegheny County, Pennsylvania as a location provide an excellent laboratory for study. Standard organizational designs based on hierarchy often fail to meet the urgent need of a diverse system of actors pursuing a heterogeneous set of goals within a common action arena. The policy arena and physical location provide such diversity and stimulate such complex patterns of interaction that a hierarchical structure would be an insufficient management strategy. With hundreds of smaller organizations interacting, the system integrates and achieves larger policy objectives because managers make policy decisions to reach across boundaries and coordinate activities.



## **5.0 COOPERATIVE ACTIVITIES: THE BUILDING BLOCKS FOR POLYCENTRIC SYSTEMS OF GOVERNANCE**

The previous chapter outlines the variability in emergency management agencies as well as the social, built, and geophysical conditions in which they operate. These conditions require various types of activities and strategies for action in order to address a range of needs. The previous chapter also identifies the various scales on which agencies operate such as levels of government, sector, and discipline.

Threats and vulnerabilities within the field study area create opportunities for cooperation. Interaction and communication then facilitates the creation, exchange, and adoption of shared strategies for action. This chapter studies cooperative activities as the building blocks for polycentric systems of governance. It reveals who works with whom and on what activities, while also identifying the scales on which cooperation occurs and the levels of integration achieved. I present a model of an integrated, interdependent system of emergency management, as opposed to the established sequential cycle of disaster response.

Analysis of semi-structured interviews demonstrates that joint activities integrate agencies into subsystems based on various goals. These subsystems aggregate to create a larger, overall emergency management system. I demonstrate this phenomenon by identifying several types of joint activities and modeling how they link agencies together. These types of interaction

build systems of polycentric governance that scale up and out to include agencies across levels of government, sectors, and disciplines.

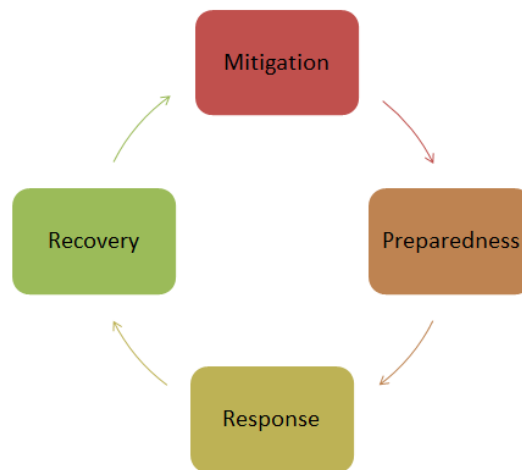
## **5.1 COOPERATIVE ACTIVITIES AS BUILDING BLOCKS**

Analysis of semi-structured interviews confirms Ostrom's (2005) model of polycentric systems in which organizations operate as components of a larger system. Some cooperative activities in emergency management require the involvement of different types of organizations, which vary in terms of level of government (jurisdiction), sector, and discipline, in addition to the experience, training, and knowledge exhibited by personnel. The diversity of organizational capacities provides the flexibility to meet both routine requirements and also rapidly evolving, dynamic demands.

The field study area is able to scale up to include other levels of government, but also scale out to incorporate additional jurisdictions, disciplines, and organizations from other sectors. The present study pays particular attention to the local level (municipal and county) as it shoulders the primary responsibility for emergency management. The role of regional, state, and national actors in working with local agencies and creating the rules in which local agencies operate is also explored.

## 5.2 EMERGENCY AND DISASTER MANAGEMENT AS AN INTERDEPENDENT SYSTEM, NOT A CYCLE

What the analysis of semi-structured interviews makes apparent is that, in practice, emergency managers do not strictly follow a list of sequential steps to achieve intended goals. The prevailing model of disaster response characterizes a cycle of tasks starting with mitigation leading to preparedness, which fosters response that is then followed by recovery activities (as modeled in Figure 5).



**Figure 5: Conventional Cycle of Emergency Management**

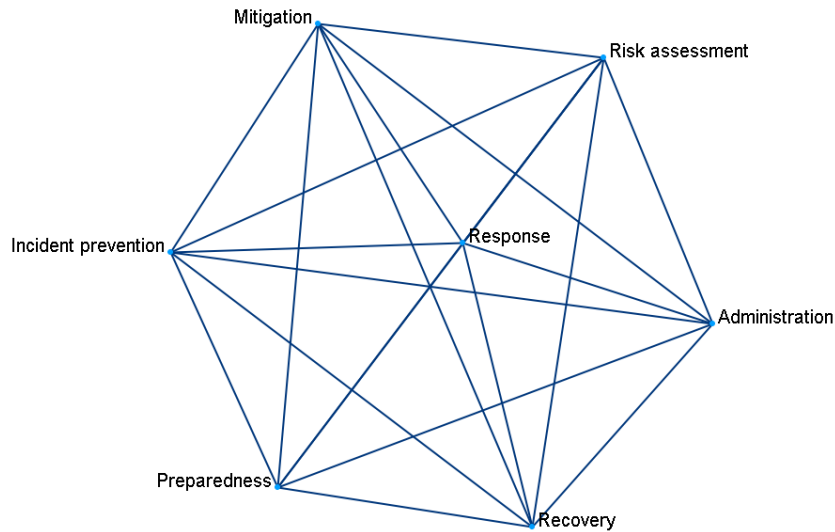
The sequential model, or life cycle model, (Figure 5) shows emergency managers moving in order from mitigation to recovery, but neglects the nonsequential manner in which risk is recognized, strategies are prioritized, and action is taken during related activities. It essentially fails to capture emergency management's complexity. Efforts to formulate a model have been recommended (Neal 1997).

Overall, the field should now recognize the following related characteristics of how disaster phases are currently used. First, different phases may occur simultaneously. Second, what happens (or does not happen) during one period (e.g., amount of mitigation

or preparation) directly effects what happens (or does not happen) during another period (e.g., response, recovery). Theoretically and conceptually, disaster researchers and practitioners should change their thinking about disaster phases and recognize their interconnectiveness (Neal 1997, p. 154).

This study presents an interconnected model of emergency management. I argue that lessons learned from a number of experiences influence how decision makers devise strategies for future action in nonsequential patterns. Lessons learned from a past incident, for example, may motivate a new training program. A conversation during a joint administrative project may lead to the recognition of risk and prompt a new mitigation initiative. Activity during a recovery effort may generate information useful to responders during a future incident. The relationships that create the system often can be characterized by multiplexity or the existence of “multiple ties between two nodes” (Isett and Provan 2005, p. 158). Agencies often cooperate on a number of projects and activities. One interaction may lead to another and interaction on multiple projects may create stronger, more robust relationships.

Figure 6 models how experience and information gained from a number of activities prompts (or influences) any number of other activities. Following interactions between agencies, interpretations of the results feed back into the organizations’ knowledge systems. Analysis of semi-structured interviews reveals that past positive experiences promotes the likelihood of future interaction. This reaffirms Ostrom’s (2005) research on decision making. “When the interactions yielding outcomes are productive for those involved, the participants may increase their commitment to maintaining the structure of the situation” (Ostrom 2005, p. 14). Conversely, if a situation yields unfavorable results, participants may decide to change their strategies. Strategies that emerge in one action situation, therefore, influence patterns of interaction on other levels.



**Figure 6: An Interdependent Model of Cooperative Activities**

### **5.3 COOPERATIVE ACTIVITIES AND SYSTEM INTEGRATION**

Participation in cooperative activities influences the degree to which systems integrate. The existing patterns of interaction in an array of activities represent an indication of resilience or “the capacity for collective action in the face of unexpected extreme events that shatter infrastructure and disrupt normal operating conditions” (Comfort, Oh, Ertan, and Scheinert 2010, p. 33). The level of system integration and the extent to which the system’s collective cognition recognizes need affects the ability of actors to self-organize to achieve shared goals.

Participation in cooperative activities links organizations into the larger system of emergency management. These linkages create the structure of interaction, which facilitates information exchange, resource sharing, skill development, and organizational learning. The time, resources, and number of personnel required to establish and maintain these linkages vary per cooperative activity. The sections below identify the different types of cooperation and the

extent to which they occur. They also demonstrate how cooperative activities integrate participants together into a larger set of interdependent agencies. They identify key activities critical to integration, useful sources of information, and the degree to which activities link agencies both within and between disciplines, levels of government, and sectors.

Disaster management literature focuses on the four phases of response: mitigation, preparation, response, and recovery (Mileti 1999; Donahoe and Joyce 2001; Waugh and Tierney 2007). To explore the emergency management system prior to, during, and after dynamic events, the present study expands the typology to include additional administrative tasks, emphasizing tasks previously classified as disaster management subcomponents. Analysis of the semi-structured interviews supports the present study's focus on risk assessment, mitigation, preparedness, response, recovery, evaluation and corrective action, and administrative activities as core systemic functions. Some agencies achieve what they label as "operational consolidation" with other agencies where they plan, train, and respond to threats as one group, but maintain separate administrative structures and organizational identities.

Each cooperative activity varies in terms of required time, resources, manpower, and information sharing. Analysis of semi-structured interviews confirms that information exchange (through multiple channels) facilitate these activities. All of these activities are pursued by both formal and informal strategies for action.

The goals of agencies and the activities they pursue create the opportunities to cross organizational boundaries. The overarching goal of emergency management is to protect life and property. First responders, as outlined in Chapter 4, pursue a diverse set of functions including fire suppression, law enforcement, and emergency medical services. Agencies from higher levels of government also engage in diverse sets of activities. There are many cross over points,

however, where agencies engage in both intra-disciplinary and inter-disciplinary cooperation to pursue shared or complementary goals as the extant literature suggests (Kearns 2000; Cigler 1999). Several activities, as outlined below, provide the opportunity for agencies to interact.

### **5.3.1 Mapping the Relationships between Cooperative Activities and Types of Organizations**

The present study models interagency relationships created through cooperative activities. Content analysis of the semi-structured interviews provides data on interactions. Using the social network analysis software UCINET (Borgatti, Everett and Freeman 2002), network analysis was conducted to create bimodal maps to conceptually demonstrate the degree to which the system integrates due to cooperative activities. The present study introduces several bimodal network maps below which include actors and actions. These conceptual maps show how activities connect agencies at different levels together and how these activities might generate, change, and reinforce the existing systemic structure. The maps serve as visual models to demonstrate levels of integration and interdependence. By identifying central actors, cut points, and siloed (or disconnected) agencies, I demonstrate how systems integrate or fail to do so.

### **5.3.2 Risk (and Vulnerability) Assessment**

Risk assessment, an activity in which actors survey their environments through both formal and informal methods to identify risks and vulnerabilities, represents a continuous process of information search and (occasional) exchange during all phases of emergency management. Identifying hazards and assessing the extent to which a community is vulnerable offers two

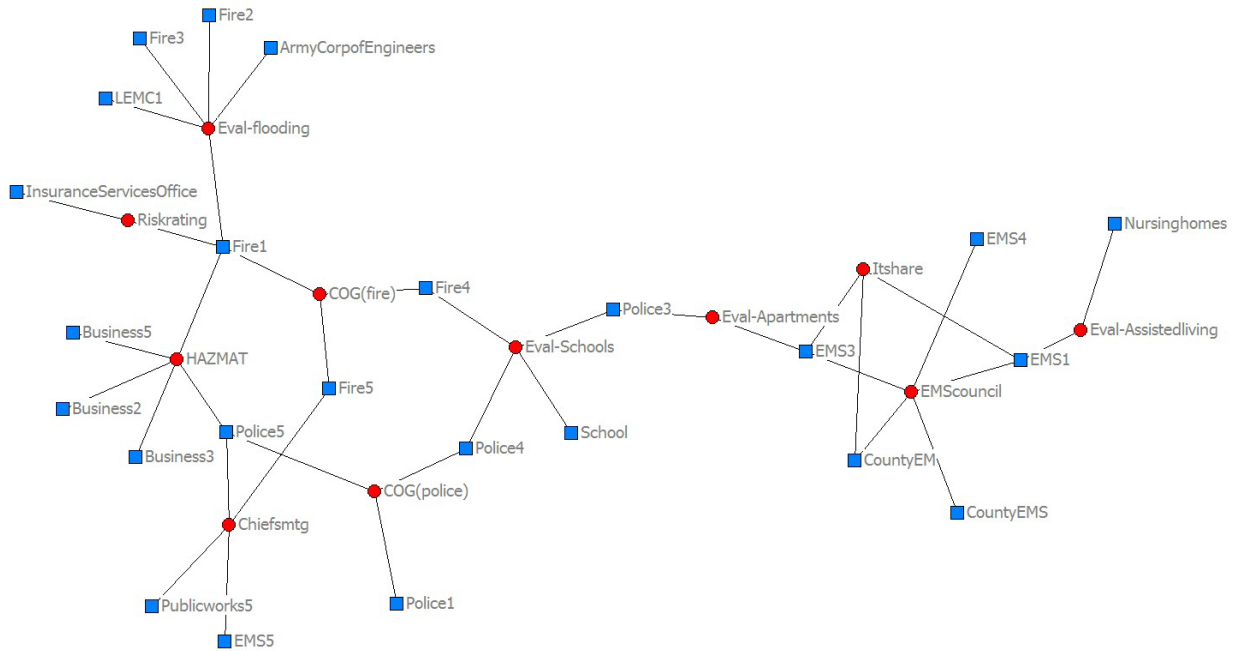
examples of risk assessment activities. The assessment of risk can, and often is, conducted as an intra-agency activity. As risks transcend political and organizational boundaries, information is sometimes either produced jointly or produced independently, but then shared among relevant agencies. These activities create a network of agencies focused on risk (and vulnerability) assessment.

### **5.3.2.1 Integration of Subsystem—Risk (and Vulnerability) Assessment**

Figure 7 demonstrates how various activities link agencies together into a risk assessment-based subsystem. As demonstrated by Figure 7, evaluating infrastructure receives considerable attention during the risk assessment process and integrates the activities of multiple disciplines. According to the semi-structured interview data, facility evaluations play an important role in connecting fire, police, and EMS as well actors from other sectors. Figure 7 shows that the cooperative activities of evaluating school facilities and apartment buildings serve as network “cut points.” That is without these activities, the system would be disconnected.

Joint risk assessment activities bridge levels of government, sectors, and disciplines. These activities represent cases in which the goals and operations of various agencies overlap to promote cooperation. Council of government groups based on discipline, for example, provide a forum for emergency managers to span their jurisdictional boundaries and work together on risk assessment. Another example is the mandate requiring local businesses to report hazardous material to municipal officials. This reporting process encourages interaction between business and emergency managers. The information obtained encourages communication between these municipal officials, building inspectors, and emergency managers.





**Figure 7: Diagram of Agencies and Risk Assessment Activities**

**Circle (red) = Activity; Square (blue) = Organization**

**Table 19: Types of Risk Assessment Activities**

<i>Acronym</i>	<i>Activity</i>	<i>Acronym</i>	<i>Activity</i>
Chiefsmtg	Meeting - municipal chiefs	Eval-flooding	Identifying vulnerability to flooding
COG(fire)	Meeting - COG fire	Eval-Schools	Facility evals - Schools
COG(police)	Meeting - COG police	HAZMAT	Reporting hazardous materials
EMScouncil	Meeting - county ems council	Itshare	Info sharing through IT
Eval-Apartments	Facility evals - Apartment bldg	Riskrating	Insurance Service Office rating
Eval-Assistedliving	Facility evals - Nursing homes		

### 5.3.2.2 Lack of Integration—Risk (and Vulnerability) Assessment

The field study’s risk assessment subsystem lacks significant involvement from state and federal agencies. Analysis of semi-structured interviews reveals the predominance of local agencies in the risk assessment system. “Risk assessment information is pushed up from the local level. The folks at the local level know their communities and what their vulnerabilities

are... and what they need to deal with,” Respondent 39 indicated. However, opportunities exist for state and federal agencies to promote that activity. Figure 10 does not include the efforts of the Department of Homeland Security to identify vulnerable infrastructure, which indicates a lack of integration with local agencies.

For agencies that engage in joint risk assessment, they do so infrequently. Survey results demonstrate that, for the majority of agencies (56.7 percent), cooperative risk assessment occurred less frequently, ranging from three times a year to every other year. A sizable portion (18.9 percent) fails altogether to assess risk jointly (including 4 out of the 10 EMS agencies surveyed).

### **5.3.2.3 Integration of Activities into the Larger System—Risk (and Vulnerability) Assessment**

Analysis of semi-structured interviews indicates that risk assessment generates the impetus for mitigation and incident prevention. The information gained in these activities helps decision makers to prioritize preparedness activities. It can also inform responders during the response and recovery phases. Risk assessment provides a necessary function for mitigation and incident prevention efforts. If a manager does not recognize the nature or severity of a risk, he or she is less likely to invest in mitigation and planning.

### **5.3.3 Mitigation and Incident Prevention**

Mitigation functions are “activities taken to reduce the severity or consequences of an emergency” (National Fire Protection Association 2007, p. 1600-5). Incident prevention activities are intended to prevent an incident from occurring. Most first responders interviewed

focus on education initiatives or deterrence to prevent various hazards and crimes. One joint mitigation activity pursued by local municipalities is the dredging of creeks and other waterways to reduce the likelihood of catastrophic flooding. Specific prevention functions differ by discipline. Fire departments conduct fire prevention courses and offer free home inspections. EMS agencies increasingly engage in public health functions such as administering vaccinations to prevent the spread of communicable diseases. Police departments dedicate manpower for violence prevention in schools, DUI checkpoints, and heavy machinery inspection, in addition to their violent crime prevention programs.

#### **5.3.3.1 Integration of Subsystem—Mitigation and Incident Prevention**

Most agencies that pursue joint mitigation and incident prevention do so independently. The incident prevention and mitigation network in Allegheny County, therefore, is sparse (so sparse and disconnected that the present study does not report the fragmented system diagram). First response agencies by in large do not participate in traditional types of mitigation work facilitated through zoning and code enforcement, analysis indicates.

Analysis of semi-structured interviews reveals little joint mitigation/incident prevention activities among agencies of the same discipline. Interactions generally occur between agencies operating in the same municipality or between local municipalities and agencies from higher levels of government. Respondent 45 recounted the intergovernmental coordination during a mitigation program to prevent flooding in his municipality. “Every spring and every summer, the street department foreman, myself, and one councilman will walk around to observe the stream levels.” The group then assesses their community’s risk of flooding. “We want to see if the streams are clear. We work with the Army Corps of Engineers... They dredge the streams to remove debris. Last June, they removed, from one stream, 65 tons of debris.”

As a discipline, police participate in joint incident prevention projects more frequently (63.6 percent) than the other two disciplines; fire (31.8 percent) and EMS (10.0 percent). Law enforcement activities such as DUI checkpoints; joint trailer and heavy equipment inspection; and other crime prevention programs account for the difference in cooperation. While semi-structured interviews indicate that some fire and EMS agencies dedicate considerable time and resources to prevention programs, they less regularly do so in conjunction with other agencies.

### **5.3.3.2 Lack of Integration—Mitigation and Incident Prevention**

Respondent 35 characterized the lack of joint activities in terms of mitigation and incident prevention. “I don't think we really get into the mitigation side.” First responder agencies generally lack a coordinated mitigation program. It makes sense for the responders who know their communities to collaborate with building inspection personnel to mitigate against potential hazards, but for most part first responders consider this work to be either outside of their responsibilities (with a few exceptions) or not supported by the municipality with resources. Municipalities waiting for higher level support do not recognize state and federal mitigation grant programs.

### **5.3.3.3 Integration of Activities—Mitigation and Incident Prevention**

Mitigation and incident prevention programs do not always achieve their intended goals. However, participation in these activities provides agencies with updated information on the nature and probability of possible events. The coordination of external grants or organizing work with the Army Corps of Engineers strengthens administrative relationships and networking in general. These relationships may translate to expand later response and recovery operations as operators become more familiar with the environments and potential threats.

#### **5.3.4 Preparedness**

Preparedness is a phase of emergency management and disaster response management comprised of a number of activities, including planning, training, and the coordination of large-scale exercises. Preparedness “refers to the readiness of a jurisdiction to react constructively to threats from the environment in a way that minimizes the negative consequences of impact ...” (Perry and Lindell 2003, p. 338). Planning to develop strategies to deal with response and recovery efforts is not uncommon in Allegheny County. In fact, they are required by state law. However, the extent to which agencies plan individually and plan collaboratively across agencies and jurisdictions varies.

Agencies’ readiness to respond depends in part on their recognition of those threats and how they fit into a common operating picture that adequately encompasses the reality of the situation. This situational awareness is facilitated by information search and exchange at times focused on risk and vulnerability assessment. The intensity of planning and training increases with the agency’s anticipation of an extreme event. Similarly, major preplanned events spur joint preparedness activities.

#### **5.3.5 Planning**

In the field study area, multiagency planning activities range from filling out and submitting “boiler plate” templates to the County Emergency Services (as Respondent 20 describes it) to conducting more deliberate, coordinated planning exercises and discussions related to both municipal emergency operations plans (MEOP) and regional planning. Some first responders preplan for both routine, day-to-day response as well as large-scale disasters. They plan in a



**Table 20: Types of Planning Activities**

<i>Acronym</i>	<i>Activity</i>	<i>Acronym</i>	<i>Activity</i>
AL	Assisted living facility plan	MEOP(c)	Municipal emergency ops plan (c)
CEOP	County emergency ops plan	Nuclear	Nuclear facility plan
EOPtemp	Emergency ops plan template	Ops	Operations planning
Evac	Evacuation	PC(COG)	Planning committee (COG)
HAZMAT	Hazmat	PC(EMC)	Planning committee (EMC)
Industry	Industrial facility plan	PC(EMS)	Planning committee (EMS)
ITshare	Info sharing through info technology	PC(R13)	Planning committee (Region 13)
Informal	Informal planning meeting	PPE	Preplanned events
LEPC	Local emergency planning committee	RM	Resource management
Mall	Mall plan	Runcards	Run cards
Mit	Mitigation	School	School plan
MEOP(a)	Municipal emergency ops plan (a)	Threat	Specific threat
MEOP(b)	Municipal emergency ops plan (b)	Univ	University plan

For example, County 9-1-1 plays a central role in facilitating planning. Figure 8 graphically depicts the centrality of run card planning in integrating the system. First responders submit “run cards” to county dispatchers rank ordering agency preference for mutual aid partners. During an incident, a commander relays his or her run card request, i.e. first, second, third, fourth, or fifth preference for mutual aid and dispatch will contact that pre-assigned agency. Some emergency managers update their run card order regularly. Others do not. The run cards, regardless, encourage chiefs to think through their needs and rank order neighboring assets.

At the center of Figure 8 are planning committees (PCs) that are organized based on discipline and/or location (municipality, council of government, etc.) Some regular municipal planning meetings consist of municipal managers, public works, police, fire, and EMS directors. The planning process in this activity, according to Respondent 22, “is not highly formal. We’re sitting down and saying, hey, we’ve got this coming up or we’ve got that coming up.” These

types of meeting are not the norm across the field study area, but they do occur sporadically depending on the volition of a municipality's leaders.

In addition to municipal-based meetings, planning committees are also organized by discipline and region. Figure 8 displays several planning committee activities based on discipline (EMS and local emergency management coordinators) as well as meetings of organizations grouped by council of government. These regional activities field separate police and fire committees.

The state emergency management agency plays a significant role in the system despite not interacting directly with municipalities on a regular basis. "We provide the municipality with a model plan so that everybody is on the same sheet of music about contingency plans based off of federal guidance," Respondent 55 offered. Title 35 of the Commonwealth Code mandates that PEMA provides municipalities with planning templates. PEMA creates the planning templates and county emergency services distributes them. Municipalities annually submit the planning document to their county emergency management agency that then submits them to the state. Municipal actors, particularly LEMCs, rely on county personnel for input and guidance, but not state personnel.

Analysis of semi-structured interviews indicates that the integration of public and private sector agencies are the strongest during planning activities. County Emergency Services, for example, organizes a diverse group of 60 public, private, and nonprofit agencies for planning purposes focused on hazardous materials. The Allegheny County Local Emergency Planning Committee (LEPC) includes representatives from public safety, medical services, and private industry among others. The maintenance of the group is mandated by SARA Title III, the Emergency Planning and Community Right-to-Know Act of 1986. The LEPC, created for



HAZMAT purposes also doubles as the Citizens Corps Council (CCC), which assists County Emergency Services in creating a broader, all-hazard plan to mitigate, respond, and recover from an array of potential hazards. (Allegheny County Emergency Services 2010b).

### **5.3.5.2 Lack of Integration—Planning**

Some agencies do not plan with other agencies. According to the survey data, a sizable portion (21.6 percent) fail to participate in any joint planning whatsoever, either completely disengaged or reliant upon their local emergency management coordinator to communicate relevant information. Another sizable portion (24.3 percent) participate in planning sessions only once a year, usually as part of the state-mandated update of municipal operations plans.

In Pennsylvania, Title 35 requires municipalities to create an emergency operations plan. While PEMA provides the template for response plans, they (not the county emergency management offices) review or provide feedback on the final products. Several respondents viewed the planning process as a checklist. “Most of these plans are boilerplate. You just plug your information in them. When the shit hits the fan, maybe they help” (Respondent 20).

Analysis of the semi-structured interviews identifies the prevalence of a lack of integration between some local emergency management coordinators (LEMCs) and their municipal agencies, especially nonprofit EMS agencies. Active LEMCs play a pivotal role, as boundary spanners, connecting state, county, and other municipal resources with their local agencies. Without LEMC support, agencies may lose access to important information.

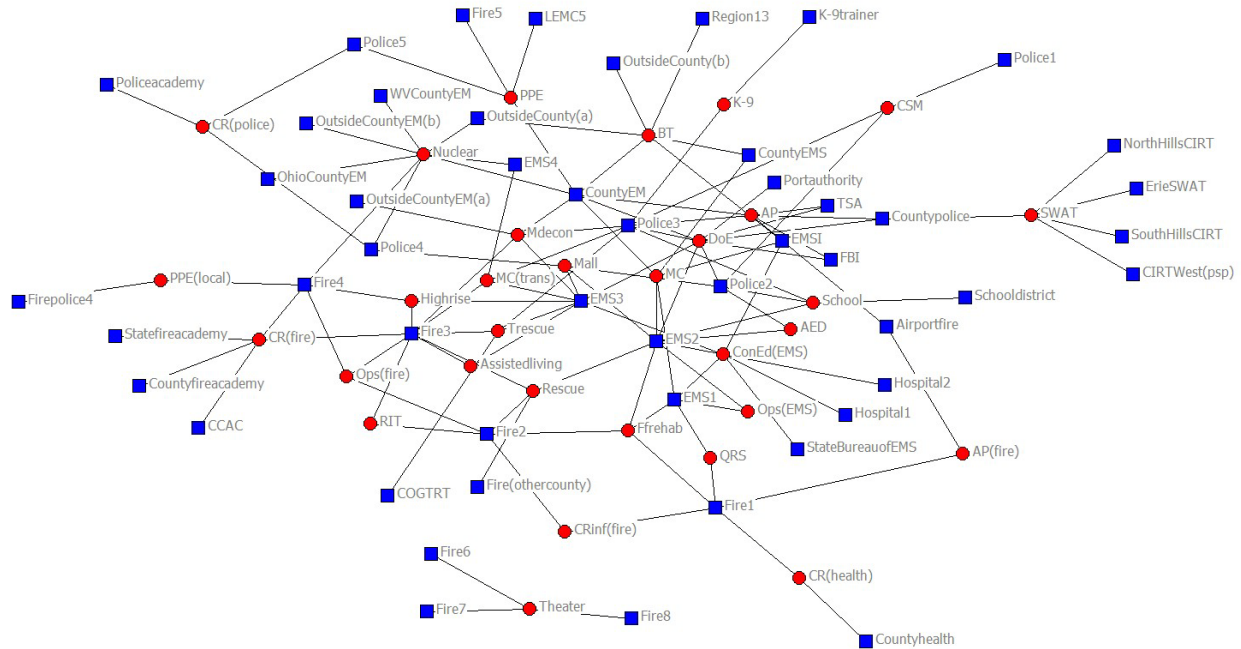
### *Integration of Activities—Planning*

Joint planning leads to additional activities. Analysis of the semi-structured interviews indicates that the decision whether to plan with other agencies influences related decisions regarding training, resource management, and information search.

#### **5.3.6 Training**

A considerable percentage of survey respondents (89.1 percent) engaged in interagency training at least once a year. Several types of training are used in the field study area, as demonstrated by Table 21, including classroom lectures, table-top exercises, discipline-related skill training, discipline-related incident simulations, and large-scale incident response exercises. Effective training requires relevant information on potential threats and specific best practices on how to effectively respond to those hazards. Local first responders initiate training for a number of relatively routine (or at least anticipated) events, as described below. Agencies at the county, regional, state, and federal levels facilitate larger-scale exercises that either anticipate a low probability, high risk incident occurring or prepare personnel for preplanned events, such as the G20 summit, Super Bowl celebrations, or March Madness (student celebration and riots) in the case of the field study area.

### 5.3.6.1 Integration of Subsystem



**Figure 9: Diagram of Agencies and Training Activities**

**Circle (red) = Activity; Square (blue) = Organization**

**Table 21: Types of Training Activities**

<i>Acronym</i>	<i>Activity</i>	<i>Acronym</i>	<i>Activity</i>
AED	Automated external defibrillator	MC	Mass casualty
AP	Airport emergency exercise	MC(trans)	Mass casualty (transportation)
AP(fire)	Airport (fire)	Mdecon	Mass decontamination
Assistedliving	Assisted living	Nuclear	Nuclear
BT	Bio terrorism	Ops(EMS)	Operations (EMS)
ConEd(EMS)	Continuing education (EMS)	Ops(fire)	Operations (fire)
CR(fire)	Classroom (fire)	PPE	Preplanned event
CR(health)	Classroom (health)	PPE(local)	Preplanned event (local)
CR(police)	Classroom (police)	QRS	Quick response service
CRinf(fire)	Classroom - informal (fire)	Rescue	Rescue
CSM	Crime scene management	RIT	Rapid intervention team
DoE	Dept. of Energy	School	School
Ffrehab	Firefighter rehab	SWAT	SWAT
Highrise	High rise	Theater	Theater
K-9	K-9	Trescue	Technical rescue
Mall	Mall		

Training, in preparation for discipline-specific emergencies, links levels of government, sectors, and disciplines. As visually depicted in Figure 9, assisted living facilities, high rise apartments, and unique facilities such as shopping centers, schools, and factories, provide areas of concern that fire and police departments focus on with the occasional participation from EMS agencies. Other facilities, especially those considered to be potential targets for terrorism, serve as training grounds for multiple response agencies. Funded by federal and state agencies, large-scale exercises focused on the international airport, nuclear facilities, and the US Department of Energy's local research facility integrate agencies from across levels of government, sectors, and disciplines (as demonstrated in Figure 9).

Inter-disciplinary training occurs in preparation for potential large-scale events. Mass casualty training, for example, connects EMSI, the county EMS bureau, the Port Authority, and local EMS agencies. SWAT and critical incident response team (CIRT) training links local municipal police departments with county police, state police, and some federal resources as well as with SWAT teams from other regions of Pennsylvania and EMS agencies.

Preplanned events, such as the G-20 summit, Super Bowl celebrations, and March Madness, pose potential crowd control problems as well as targets for terrorist activity. The G-20 summit spurred the City of Pittsburgh and County Emergency Services to plan and exercise closely with agencies across the scale of government, i.e. outside county and municipal assets and up the scale, i.e. the FBI, the Secret Service, the Department of Homeland Security, and foreign security and law enforcement agencies.

#### **5.3.6.2 Lack of Integration—Training**

On the municipal-level, regular training between fire, police, and EMS appears to be the exception rather than the rule according to the analysis of semi-structured interviews.

Respondent 6, a fire chief, commented that his department does not train with the police and seldom exercises with EMS agencies. Instead, his agency takes an ad hoc approach to incident coordination. “Normally when an accident occurs, it’s up to us with regard to what we want [police and EMS] to do and how we want them to handle it” (Respondent 6). Some LEMCs, particularly those who are paid, help to organize inter-municipal training, but many municipalities lack a LEMC who actively coordinates training. One EMS director who administers several municipalities confirms this, “as far as joint training coordinated by municipal emergency management coordinators, we see very little” (Respondent 35).

### **5.3.6.3 Integration of Activities—Training**

As described in the planning section above, planning and training prepare agencies for an array of contingencies. Lessons learned during preparedness activities facilitate effective response operations. One emergency manager characterized the integrating role preparedness activities as a way to improve response operations. “Good interagency coordination and cooperation doesn’t happen accidentally. It is helped by the kind of exercises and training opportunities that we can do before an event” (Respondent 53). While training is recognized as a direct contribution to response effectiveness, activities also identify opportunities for additional preparedness and risk assessment functions.

### **5.3.7 Response**

“When the whistle... In the emergency service, there something to be said when the whistle blows even the police realize ‘the more the merrier’ send people out...” (Respondent 28, police).

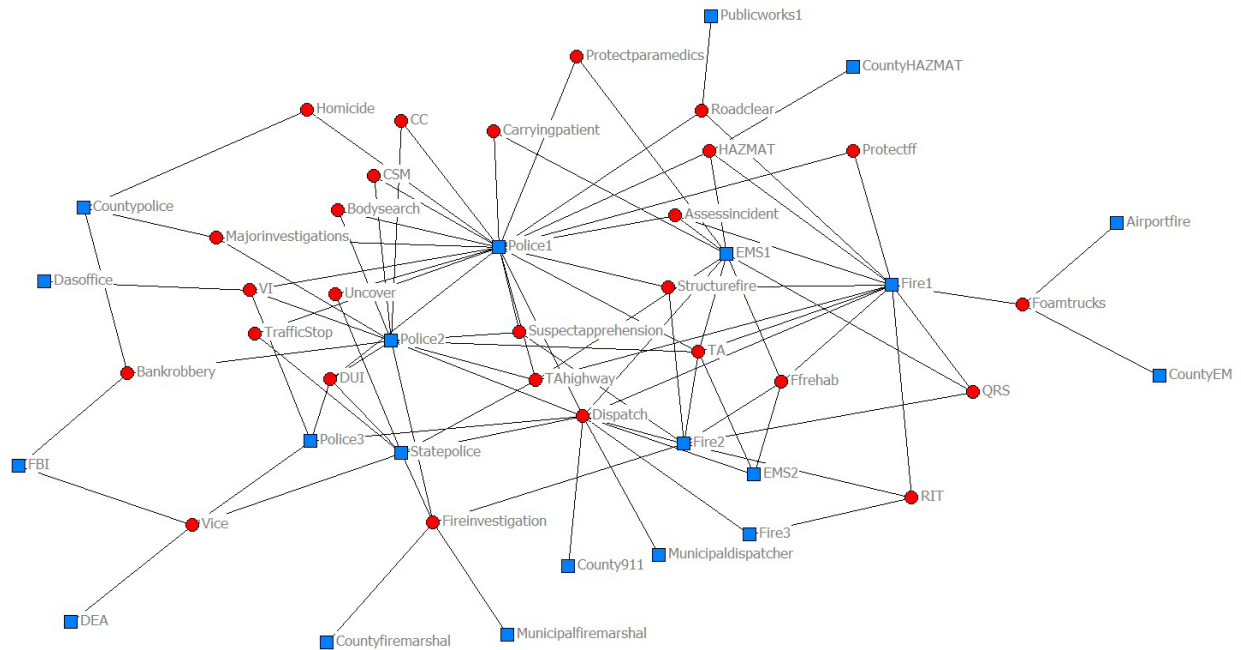
Response is a highly visible type of cooperative activity. NFPA 1600 defines response as “immediate and ongoing activities, tasks, programs, and systems to manage the effects of an incident that threatens life, property, operations, or the environment” (p. 1600-5). Response activities create opportunities for agencies to interact on regular basis, depending on the frequency and location of the incident type. All first responders surveyed (100 percent) indicated that they respond jointly at least once a month. The two sections below map the patterns of interaction and types of activities occurring during response both to routine events and also to large-scale, rapidly evolving dynamic events.

### **5.3.8 Response (Routine)**

Agencies coordinate both intra-disciplinary and inter-disciplinary joint functions related to response. Analysis of semi-structured interviews identifies several types of intra-disciplinary cooperation: fire departments implementing fire suppression tactics; police working together during law enforcement activities; and EMS agencies coordinating patient care and transportation. These activities are displayed in Figure 10.

### 5.3.8.1 Integration of Subsystem—Response (Routine)

County 9-1-1 serves as a central hub for information. Figure 10 visually demonstrates the centrality of dispatching first responders during emergency calls. County 9-1-1 and to a lesser extent the few self-dispatching municipalities remaining play a critical role in linking disciplines and levels of government during a response to both routine and large-scale events.



**Figure 10: Diagram of Agencies and Routine Response Activities**

**Circle (red) = Activity; Square (blue) = Organization**

**Table 22: Types of Routine Response Activities**

<i>Acronym</i>	<i>Activity</i>	<i>Acronym</i>	<i>Activity</i>
Assessincident	Assessment of incident	Majorinvestigations	Major investigations
Bankrobbery	Bank robbery investigation	Protectff	Provide security for firefighters
Bodysearch	Body search	Protectparamedics	Provide security for paramedics
Carrying patient	Carrying patient	QRS	Quick response service
CC	Crowd control	RIT	Rapid intervention team
CSM	Crime scene management	Roadclear	Road clearing
Dispatch	Dispatch	Structure fire	Structure fire
DUI	DUI check points	Suspectapprehension	Suspect apprehension
Ffrehab	Firefighter rehab	TA	Traffic accident
Fireinvestigation	Fire investigation	Tahighway	Traffic accident (highway)
Foam trucks	Foam trucks	TrafficStop	Traffic stops (hw)
From	From	Uncover	Undercover intelligence
HAZMAT	HAZMAT	VI	Vehicle inspections
Homicide	Homicide investigations	Vice	Vice

Police cooperation during law enforcement activities is a regular occurrence in the field study area. For example, county police provide special investigations for homicides, sexual assaults, and kidnapping. The FBI participates in bank robbery investigations. Municipal law enforcement coordinates with state police on speed-limit enforcement.

Some disciplines' core, daily functions overlap. Several fire departments, for example, maintain QRS units to respond to medical emergencies. Fire department-based QRS, are often located closer to an incident than an ambulance service. EMS agencies and fire departments work together, therefore, as need arises. Also, police increasingly operate automated external defibrillators (AED) and serve as emergency medical first responders until EMS agencies arrive to take over certain incidents. These overlaps in functions facilitate collective action as one agency augments another. Volunteer fire services, occasionally, include police and paramedics in their ranks. These double-hatters provide a valuable link between agencies. Respondent 16, a



fire chief, commented that “there is no break now with police. Three or four policemen are members of the fire department. Some of them carry fire gear in their police car.”

Even when their primary functions do not overlap, first responders coordinate with other disciplines. EMS agencies commonly respond to structure fires to provide emergency scene rehabilitation to the firefighters. “Any one of our incidents that has an immediate danger to life and health has an ambulance automatically dispatched,” Respondent 13, a fire chief, commented. With respect to inter-disciplinary activities, police provide operational security for EMS and fire personnel as demonstrated in Figure 10.

#### **5.3.8.2 Lack of Integration—Response (Routine)**

Lack of integration during routine response activities occurs sporadically. Equipment such as a fire department’s foam truck might not be deployed because first responders on scene did not know it existed. Fire departments in close proximity may refuse to mutual aid together for a number of reasons, including turf battles and more frequently one department’s lower standards of professional performance.

Analysis of the semi-structured interviews indicates that some large departments refuse to work with neighboring municipalities during response operations. Some paid fire departments, the City of Pittsburgh in particular, appear to make deliberate policy decisions not cooperate. One neighboring fire chief recounts a single response experience with a large, paid department. “My only experience with [them] was when there was a house right on the border and they showed up first and realized that it was in [our municipality], they saw us pull up and they packed up their things and they left. They could have stayed” (Respondent 10). In addition to paid fire departments, for-profit EMS agencies appear not to be integrated into the larger system. This is explored in Chapter 7.

### **5.3.9 Response (Large-Scale)**

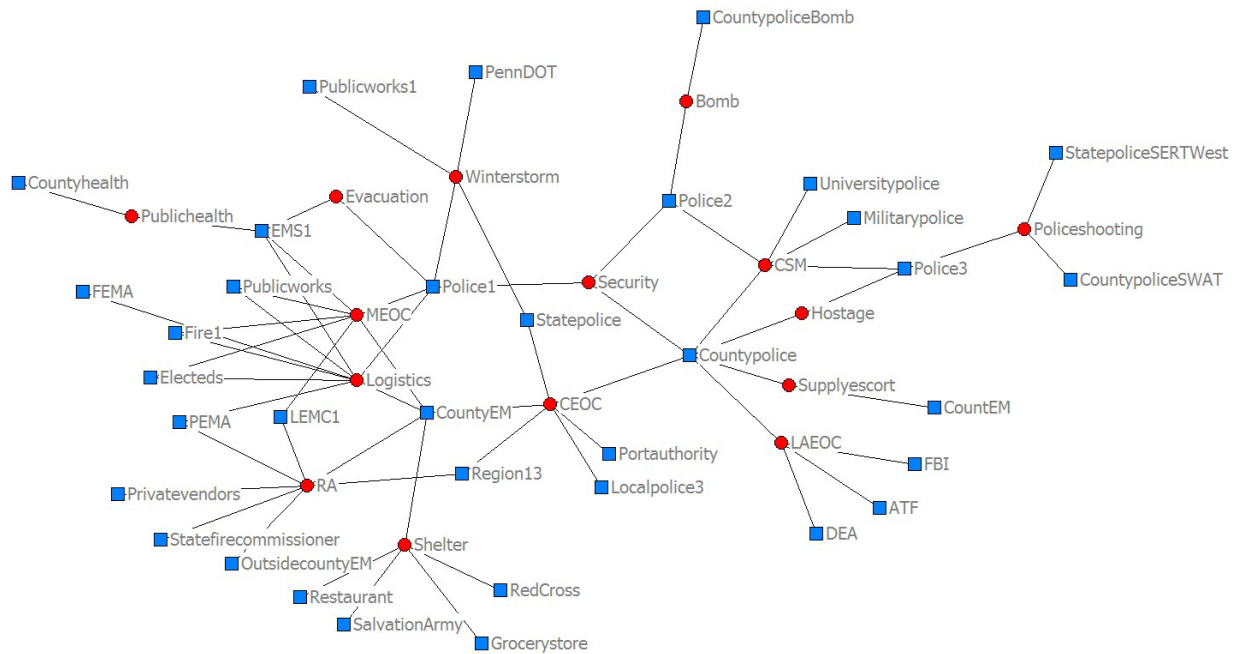
During routine incidents, agencies generally focus on specific, core competencies of public safety. Large-scale events create less ordinary and more complex demands on agencies' time, resources, and personnel. During large-scale incidents, local first responders are often unable to independently resolve the demands of their external environments. Other municipal agencies, such as public works and other personnel, participate as do other levels of government such as county, state, and sometimes federal assets.

During large-scale incidents, emergency support functions (ESFs) group agencies by functions in order to coordinate key response duties. For example, agencies participate in public works (ESF #3), firefighting (ESF #4), mass care and public health and medical services (ESF #6 and #8), oil and hazardous materials response (ESF #10), and public safety and security (ESF #13) based on their core competencies. During these activities, they may coordinate with other agencies in their disciplines or with outside agencies.

#### **5.3.9.1 Integration of Subsystem—Response (Large-Scale)**

During large-scale incidents, agencies expand their normal repertoire of actions to meet the needs of their communities. One EMS director, Respondent 35, described how his agency shifted from an emergency care provider to a public health center during response and recovery efforts during the flooding his community. “On an ongoing basis we had a trailer set up there to provide more like a clinic environment where folks could come. If a person cut their finger they could get it evaluated and cleaned up” (Respondent 35). Essentially, the agency created a clinic to support the cleanup operations. County-level assets supported their efforts. “We provided immunizations. The county public health department provided us with the vaccines... I think

our roles are defined by the incident. In that particular case, we spent almost two weeks down there just providing community health.” The EMS agency adapted (with the support of other levels of government and disciplines) to provide needed services outside of the agency’s day-to-day functions.



**Figure 11: Diagram of Agencies and Large-Scale Response Activities**

**Circle (red) = Activity; Square (blue) = Organization**

**Table 23: Types of Large-Scale Response Activities**

<i>Acronym</i>	<i>Activity</i>	<i>Acronym</i>	<i>Activity</i>
Bomb	Bomb threat	Policeshooting	Police shooting
CEOC	County EOC	Publichealth	Public health
CSM	Crime scene management	RA	Resource acquisition
Evacuation	Evacuation	Security	Security
Hostage	Hostage situation	Shelter	Shelter
LAEOC	Law enforcement EOC	Supplyescort	Supply escort
Logistics	Logistics	Winterstorm	Winter storm
MEOC	Municipal emergency operations center		

Large-scale incidents generate an array of demands in terms of time, resources, and personnel. Depending on the incident, specialized equipment may be required to respond effectively. Logistics represent an activity that integrates the system. For example, private-sector contractors are sometimes needed to procure equipment. Respondent 42, a local emergency management coordinator, indicated that “In the past, there have been several situations that Allegheny County hasn’t been able to help...” The respondent cited one example in which “the County didn’t have the right back-hoe to get into the stream and clear the channel. We had some names on our resource list of construction companies that had the necessary equipment.” The LEMC contracted out for the equipment and services. Generally, however, County Emergency Services plays a major role as a boundary spanner, connecting local agencies with needed resources and personnel during a large-scale event.

On the state-level, interorganizational communication and coordination, during large-scale incidents, are facilitated at the state EOC through emergency preparedness liaison officers (EPLOs). “All state agencies should have an EPLO who interact with all other agencies. And when we need resources I go to them” (Respondent 19). However, state involvement in local incidents varies based on an incident’s level of intensity and the need of local responders. Routine events, such as the one described above, receive little attention. As events increase in intensity, PEMA’s regular emergency operation center’s staff may be contacted whereas they collect information and try to develop situational awareness. As local resources are exhausted, PEMA will mobilize state resources per state procedures (Pennsylvania State Emergency Operations Plan).

### **5.3.9.2 Lack of Integration—Response (Large-Scale)**

Volunteer organizations (VOADs) participate in large-scale response activities. The American Red Cross is responsible for coordinating sheltering programs that may integrate local grocery stores, churches, restaurants, and the Salvation Army. They often work with public assets, like LEMCs, to coordinate response. Respondent 6 explained “We do have an evacuation team here in town that has been trained through the Red Cross. We’ve called them out probably four times in the last year for temporary sheltering.” However, the vast majority of respondents do not coordinate response with VOAs. They also do not engage in joint risk assessment or preparedness.

### **5.3.9.3 Integration of Activities—Response (Large-Scale)**

Joint response (to both routine and large-scale incidents) is by far the most frequent cooperative activity in the field study area. This frequency of interaction facilitates reasoned risk assessments and provides the justification for preparedness activities (based on past experiences). Semi-structured interviews confirm the evaluation of past experience provides the foundation for an agency’s formal and informal knowledge base. These knowledge bases justify either action or inaction in terms of other participation in other activities.

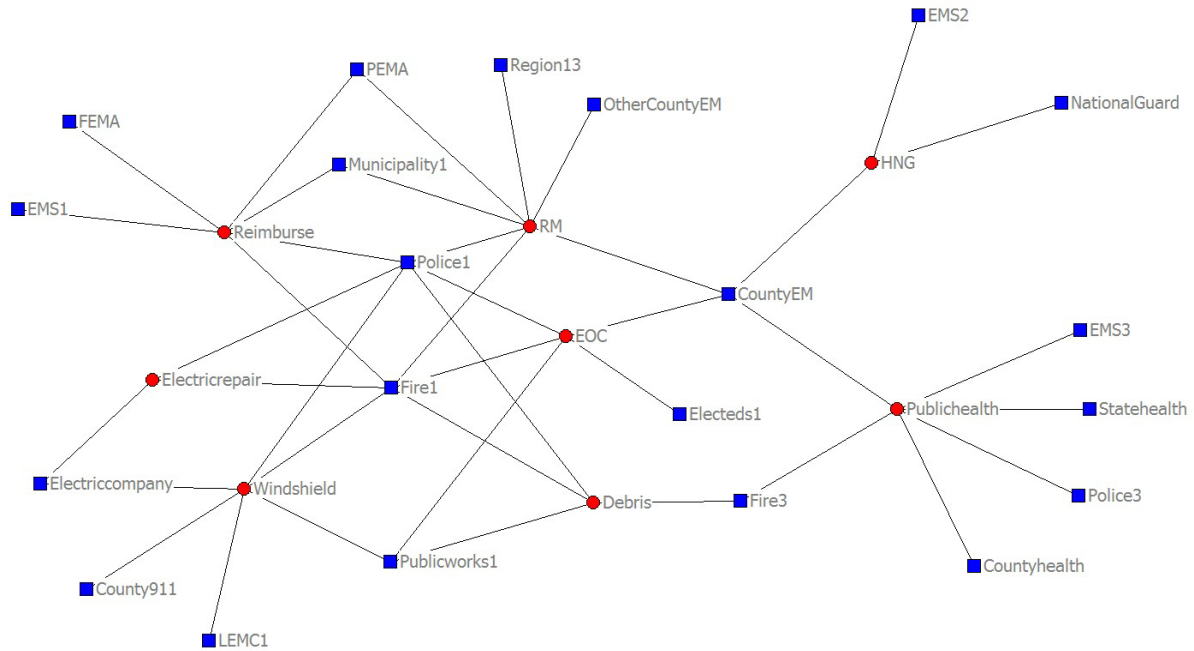
### **5.3.10 Recovery**

First responders, emergency management personnel, other government agencies such as local public works, and private-sector organizations pursue recovery activities after a response phase of an incident to “return conditions to a level that is acceptable to the entity” (National Fire Protection Association 2007, p. 1600-5). That is they restore services, facilities, and other

critical infrastructure to working order. Opportunities to participate in joint recovery efforts occur only after situations in which extreme events (flooding, windstorms, and other large-scale accidents) disrupt normal conditions. The frequency at which agencies interact is, therefore, less than during response to routine events. Of those surveyed, 86.4 percent of agencies participate in some kind of recovery effort at least once a year.

Common joint activities are debris removal, road clearing, and restoration of electricity (and other critical services like public health functions). These types of activities require the identification of projects. Police conduct “windshield surveys” to gather information and rely it back to relevant agencies for action. Other activities, especially in the aftermath of large-scale disasters, include the restoration of physical infrastructure and facilities (Donahoe and Joyce 2001).

### 5.3.10.1 Integration of Subsystem—Recovery



**Figure 12: Diagram of Agencies and Recovery Activities**

**Circle (red) = Activity; Square (blue) = Organization**

**Table 24: Types of Recovery Activities**

<i>Acronym</i>	<i>Activity</i>	<i>Acronym</i>	<i>Activity</i>
Debris	Debris removal	Publichealth	Public health
Electricrepair	Electric line repair	Reimburse	Reimbursement
EOC	EOC coordination	RM	Resource management
HNG	House National Guard	Windshield	Windshield survey

Several recovery activities integrate levels of government, sectors, and disciplines. Analysis of the semi-structured interviews indicates that police serve a major role in identifying response and recovery points and communicating this intelligence to decision makers to prompt action. Respondent 28 explained that “the police’s role is to get the road back open and make

sure that there are no safety hazards... We are the first line of communication to [the electric company] and to emergency management.” Again, some police call this intelligence gathering function “windshield surveys” where they “tabulate problems and communicate them back to other parties” (Respondent 28).

Figure 12 visually depicts the central role that police play in several activities. As police and other agencies acquire actionable information, they often communicate that information back to the EOC and county dispatch. The act of establishing the EOC and coordinating activities ranging from resource management to debris removal helps to integrate the system.

Recovery efforts require funding; therefore, higher-level government agencies and insurance companies are active following a disaster, processing claims, and distributing reimbursement checks. Figure 12 demonstrates how this reimbursement activity links federal and state resources with local-level agencies.

#### **5.3.10.2 Lack of Integration—Recovery**

Lack of communication with electric companies was a common concern expressed by respondents from all levels of government. Respondent 3 acknowledged the lack of communication between first responders and the power companies. “When there’s a power outage... communication is a problem with the power company. We will call them and they will tell us that we are on the list for later and that’s it.” The lack of coordination with utility companies is not uncommon throughout the set of emergency activities.

#### **5.3.10.3 Integration of Activities—Recovery**

As mentioned above, intelligence gathering during response facilitates at least the initial recovery phase. Like response, the efficacy of recovery efforts is bolstered by preparedness



activities. Evaluation of recovery operations may foster increased commitments to mitigation and preparedness programs in the future.

### **5.3.11 Evaluation and Corrective Action**

Evaluation and corrective action is a process that occurs during each type of cooperative activity. Any joint recognition of deficiency or shortcoming and the steps taken to rectify or improve the situation constitutes evaluation and corrective action. These activities occur in a number of situations and can be either formal or informal. The goal of agencies engaged in this activity is to learn and improve operations. Respondent 10 commented that “it helps us to reaffirm our plans and procedures. If somebody screwed up a plan or procedure, they will learn from it.” In some cases, evaluation leads to organizational learning where agencies take corrective actions to improve the efficacy of their operations.

#### **5.3.11.1 Lack of Integration—Evaluation and Corrective Action**

“As needed” was a phrase repeated again and again during the interview process to explain the lack of cooperation on this activity. According to the survey data, only 10.8 percent of respondents reported that they engage in joint critiques on a monthly basis. The “need” to evaluate and correct mistakes is recognized generally after large-scale incidents or the loss of life during operations.

#### **5.3.11.2 Integration of Subsystem—Evaluation and Corrective Action**

Evaluation and corrective action occurs infrequently. Respondents indicated that informal conversations between chiefs and line officers about joint response or training activities

occur more regularly than formal critiques. Joint hot washes, “critiques... done immediately after the event” (Respondent 17), are less common.

### **5.3.12 Administration**

The goal of agencies engaging in administrative cooperation is generally to either save money through joint purchases or to receive grants that require some form of cooperation. In terms of administrative tasks, first response agencies and other emergency management agencies enter into joint purchasing agreements. Another form of cooperation is the submission of joint grant applications, often to FEMA Regional Grants Programs in the fire discipline.

Rarely, agencies will merge their administrations, either structurally or operationally where two or more departments maintain separate administrative identities, but operate under joint operational command. The Pennsylvania Department of Community and Economic Development created a typology of regionalization activities to demonstrate possible types of administrative cooperation.<sup>21</sup> These activities range from consolidations and mergers (where agencies structural come together) to associations (where certain activities are administrated jointly through umbrella organizations) to regionalization (joint projects in which agencies retain their identity).

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<sup>21</sup> Legislative Budget and Finance Committee (2005) “The Feasibility of Regionalizing Pennsylvania's Volunteer Fire Companies” Pennsylvania General Assembly: Harrisburg, PA.

### **5.3.12.1 Integration of Subsystem—Administration**

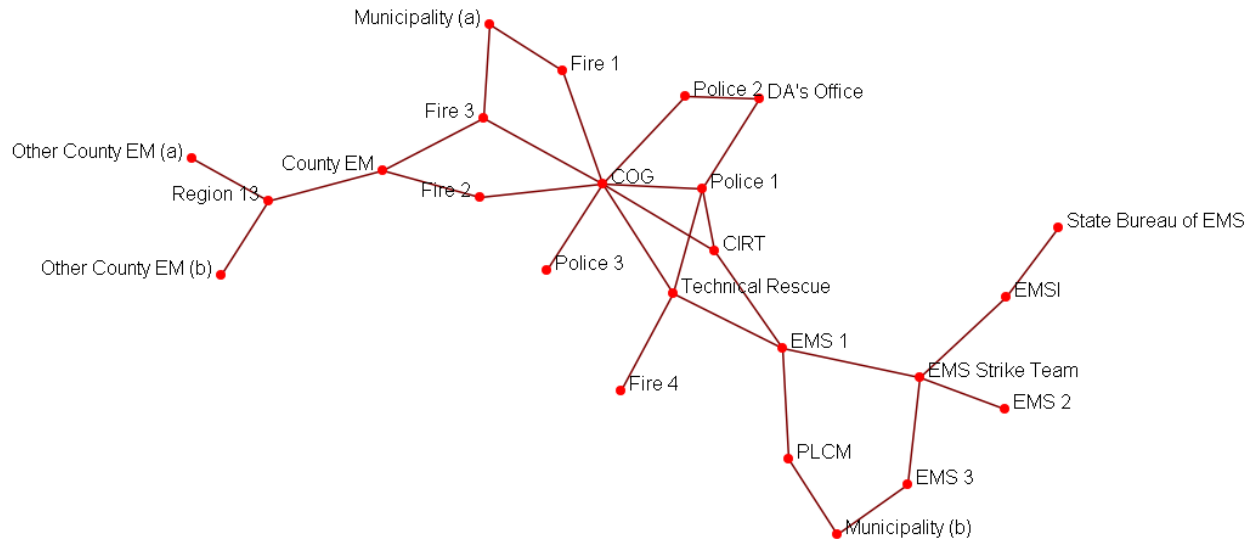
“We formally established working groups and committees to work through issues. A lot of our day-to-day business functions are where our strongest collaborations are” (Respondent 55)

With respect to joint and coordinated purchasing, a small but growing group of agencies coordinate their efforts. Figure 13, a single-mode network, reveals the patterns of interactions agencies exhibit in coordinating joint purchasing. One council of government, in particular, plays a central role in the network. The COG lessens the costs of acquiring information and provides continual administrative support, which elevates costs related to negotiating joint purchasing, both between agencies and between the purchaser and vendor. COGs represent what Weible (2010) refers to as a “collaborative institution” that brokers collaborative relationships. Respondent 10 praised the results of coordinating with his COG. “We get outstanding prices. A lot of our smaller vehicles, SUVs, and pickup trucks are bought through [the COG’s] law-enforcement group.”

### **5.3.12.2 Lack of Integration—Administration**

An area where integrating joint purchasing is weak is the fire discipline. SHACOG and the Northern Fire Chiefs Association have conducted joint purchase projects, but coordinating regular joint purchasing is difficult because of the wide range of equipment and preferences within the discipline. Respondent 10 explained that “the purchasing thing itself hasn’t gone very well because everybody’s using different equipment.” Coordinating major purchases require interagency agreement on apparatus or equipment type, brand, vendor, etc. Respondents

generally host testing, ladder testing, and pump testing as areas where joint purchasing requires little coordination beforehand and can be effectively management.



**Figure 13: Diagram of Agencies Interactions Related to Joint (or Coordinated) Purchasing**

With respect to joint grants, patterns of interaction generally appear to be limited to intra-disciplinary relationships. Neighboring departments are more likely to coordinate grant applications, but some exceptions include agencies that specialize in specific functions, such as technical rescue. State and federal agencies incentivize joint grants to varying degrees. This will be explored in Chapter 7.

## 5.4 CONCLUSION

This chapter reveals that integration on certain activities influences cooperation and integration on others. In a system with a large number of agencies operating at various levels of

government, in different professional disciplines, and in dissimilar contexts, many strategies emerge and are adopted to address the diverse set of functions characterized by risk assessment, mitigation, preparedness, response, recovery, and administrative goals. Chapter 5 employs Ostrom's (2005) IAD framework to assess cooperation at the levels of individual activities (action situations), the subsystems, and the system that these activities create, i.e. the interdependent model of emergency management. The interconnectivity facilitated by cooperation generates and reinforces the structure of the larger system. This cooperation enables agencies to administer a complex environment characterized by variability in terms of goals and demands. To understand these systems, the present study analyzes the field area on multiple scales. Chapter 6 explores the architecture of one subsystem in detail, the response system.

## **6.0 THE STRUCTURE OF EMERGENCY RESPONSE NETWORKS**

Chapter 5 demonstrates the general patterns of interaction created by several cooperative activities in an emergency management field study area. Chapter 6 investigates more closely the composition of the network and the structure created by interaction during response operations. I employ social network analysis to study data of day-to-day emergency incidents recorded by Allegheny County (Pennsylvania) 9-1-1 over a seven-month period.

I demonstrate that the network structure displays both small-world and scale-free model effects. This indicates a dense clustering between regional subgroups (a small world model) connected by a core group of disproportionately highly connected agencies (a scale-free network). These findings reveal what I label as a “neighborhood-centered network” model for emergency management and public safety.

This chapter identifies several highly connected, prominent agencies that span jurisdictional and disciplinary boundaries. These boundary spanners (county agencies, regional EMS agencies, and large municipal police departments) weave the regionally-based, neighborhood-centered clusters of interactions into the larger emergency management system. In all, findings depict a dense network with a robust capacity for information exchange necessary for the detection and response to risk.

Although a relatively dense network, there are noticeably absent players. This chapter identifies the system’s metropolitan center, the City of Pittsburgh, as a relatively disengaged

player with respect to response activities. While the semi-structured interviews identify points in which the city engages with others, i.e. planning and operations during major preplanned events, Pittsburgh agencies (the fire department in particular) demonstrate a much lower commitment to cooperation during response than do other municipalities. This withdrawal leaves a significant hole in the network to which other agencies must adapt.

Chapter 6 demonstrates a polycentric system of governance in practice that is characterized by relationships varying in terms of their level of commitment and intensity. Chapter 5 identifies how agencies may work together once (briefly) or how they may choose to operate within groups that have operationally consolidated. That is they plan, train, and respond as one unit, consistently over time, but maintain separate administrative structures and organizational identities. Most relationships fall, however, somewhere in the middle of these two types of interactions.

## **6.1 INTERLOCAL EMERGENCY MANAGEMENT NETWORKS AS SMALL-WORLD, NEIGHBORHOOD-CENTERED MODELS**

Using network analysis, this chapter models the patterns of interaction that occur during response operations to 9-1-1 calls over a seven-month period. The complete emergency management network demonstrates the small-world effect in that most agencies are connected by short distances in dense clusters of relationships (Watts and Strogatz 1998). In these densely-clustered groups, agencies exhibit social influence over one another, creating an environment in which strategies emerge and spread without a central authority (Watts 2003). Small-world models facilitate contagion, a process in which information search and exchange spreads specific

strategies for action. The field study's emergency management network fits what the present study labels a neighborhood-centered network for emergency management and public safety, as the dense clusters of relationships correspond generally with the geographic locations of the participating agencies.

The fit of the small-world model was determined using the following proximity measure from Walsh (1999, p. 289):

$$\mu = \frac{\frac{C}{C_{rg}}}{\frac{\ell}{\ell_{rg}}}$$

Analysis indicates that the complete network's proximity measure ( $\mu$  6.906) far exceeds Walsh's (1999) minimum threshold for small-world classification ( $\mu$  1.0).<sup>22</sup> It indicates that the network consists of high clustering coefficients and short mean distances. To calculate the proximity measure, the present study divided the complete network's clustering coefficient ( $C$  0.593) by the average clustering coefficient of 50 Erdős and Rényi random graphs produced via UCINET ( $C_{rg}$  0.078). The quotient of these clustering coefficients was then divided by the quotient of the mean distance of the complete network ( $\ell$  2.157) divided by the mean distance of 50 Erdős and Rényi random graphs produced via UCINET ( $\ell_{rg}$  1.989). The resulting proximity measure ( $\mu$  6.906) mathematically demonstrates that the interlocal emergency management network fits the small-world model. The final equation reads as follows:

$$6.906 = \frac{\frac{.593}{.078}}{\frac{2.157}{1.989}}$$

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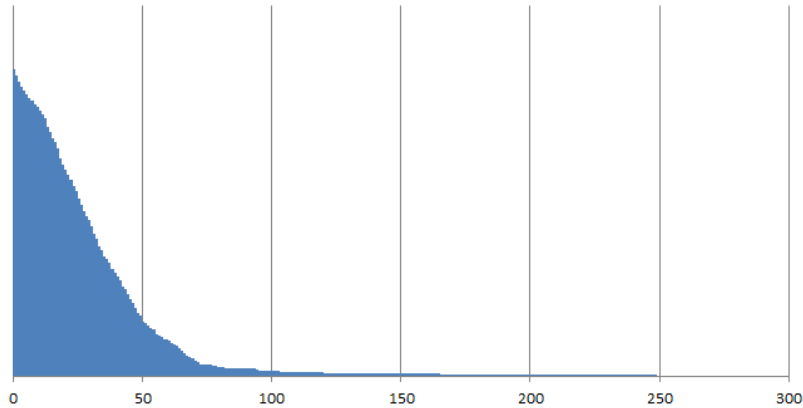
<sup>22</sup> Walsh, T. 1999. Search in a small world. In T. Dean (ed.), Proceedings of the 16th International Joint Conference on Artificial Intelligence. Morgan Kaufmann, San Francisco, CA.



## 6.2 SCALE FREE NETWORK AND BOUNDARY SPANNERS

Analysis of the network data indicates that the field study area represents a scale-free network (Barabási and Albert 1999; Barabási 2009). In other words, the system contains a group of highly connected, central agencies. The scale-free nature of the field study area indicates that there are several highly connected, prominent agencies that serve as boundary spanners. These boundary spanners (county agencies, regional EMS agencies, and some large municipal police departments) link the regional-based neighborhood-centered clusters of interactions into the larger system. Because of their centrality, the hubs in a scale-free network are able to act as information gatekeepers that possibly exert high levels of control over other agencies. As boundary spanners, these prominent agencies may also generate bridging social capital useful in connecting disparate groups.

The present study determines that the field study represents a scale-free network by assessing the distribution of centrality statistics. The degree centrality statistics, as revealed in Figure 14, follow a power law (or flat tail) distribution due to the existence of a few central nodes that connect with a disproportionate number of lesser-connected agencies. These hubs represent critical nodes on which the system depends and are explored below.



**Figure 14: Distribution of Degree Centrality (Complete Network)**

### **6.3 DENSITY AND DISTANCE**

In addition to the small-world and scale-free qualities exhibited in the field study’s network, other system-wide measures characterize the network as a densely-clustered system. First, the complete network and its subcomponent networks (fire, police, and EMS) reveal significant systemic density. Second, the network’s distance statistics (the average shortest path between any two agencies) indicate that agencies have the ability to reach others in a limited number of steps within the network, which reaffirms the system’s high level of interconnectivity.

#### **6.3.1 Density**

There are 444 active agencies listed in the 9-1-1 call data. A total of 15,286 relationships exist in the complete network between these agencies, which represents 7.74 percent of all possible relationships that could occur in a 444-member system. The overall network, therefore, has a density measure of 0.074. Analysis of discipline-based networks (police-only, fire-only, and

EMS-only) show that police (0.169), fire (0.076), and EMS (0.172) exhibit higher density scores than the overall network (0.074). This indicates that groups interact in denser patterns within their own discipline than they do with others. The police and EMS scores help to explain the particularly dense patterns of interactions modeled below in Figures 16 and 18.

### **6.3.2 Distance and Reachability**

As presented in the small-world findings, the average node-to-node distance, i.e. the average shortest path between any two agencies, is 2.229. Therefore, for any random agency to reach another agency in the network they must pass through an average 2.229 other agencies (on the network graph). For a large network (444 agencies), this low distance score reaffirms the dense, tightly-clustered structure identified above. The police network (2.058) and the EMS network (2.157) exhibit shorter mean distances than the overall network, while the fire network (3.044) is considerably longer. The fire network's average distance is reflected in Figures 20 and 21, which shows a less tightly-coupled system than the police and fire networks. In all, the complete network demonstrates a relatively tightly-coupled system in which the average agency is able to reach 70.87 percent of all other agencies in the complete network in two steps or less. This reaffirms interconnectivity and the capacity of the network in terms of information exchange.

## **6.4 SIZE AND COMPOSITION OF THE RESPONSE NETWORK**

The complete response network consists of agencies from several disciplines and jurisdictions. Table 25 reveals the size [453 active agencies (444 recorded in the 9-1-1 data)] and composition

of the system. Predominantly, municipal agencies (82.34 percent) populate the network. Regional organizations (9.49 percent), particularly nonprofit-based EMS agencies, who administer to more than one municipality, are well-positioned to interact with several agencies. Key agencies also operate from county (7.06 percent) and state (0.66 percent) jurisdictions. Most prominent federal and state agencies are excluded from the response network because incidents during the seven-month period of observation failed to require their assistance.

**Table 25: Frequency Distribution of Active Agencies by Discipline and Jurisdiction**

	EM		EMS		Fire		HAZMAT		Police		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
State	0	0	0	0	0	0	0	0	3	2.38	3	0.66
County	2	100	1	1.16	1	0.43	5	100	23	18.25	32	7.06
Regional	0	0	34	39.53	5	2.14	0	0	4	3.17	43	9.49
School District	0	0	0	0	0	0	0	0	1	0.79	1	0.22
Municipal	0	0	51	59.3	228	97.44	0	0	94	74.6	373	82.34
University	0	0	0	0	0	0	0	0	1	0.79	1	0.22
Total	2	0.44	86	18.98	234	51.66	5	1.1	126	27.81	453	100

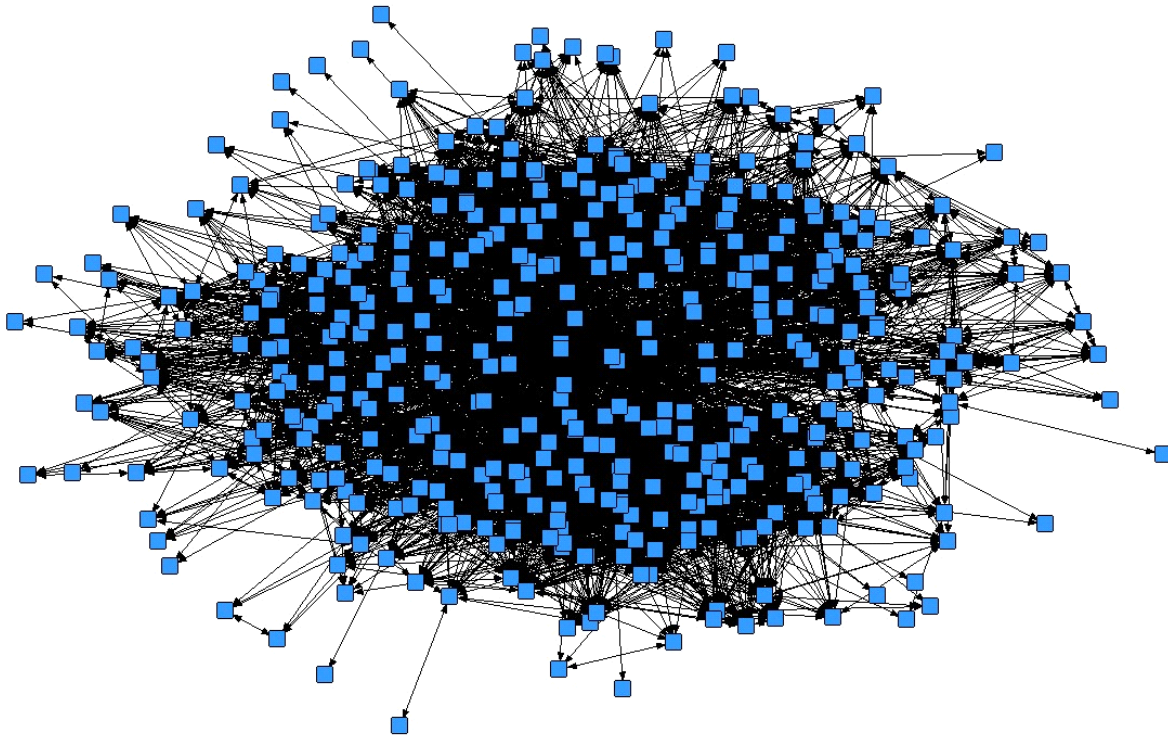
534 agencies are listed in the county 9-1-1 records.

\*453 agencies are active. 445 are recorded in the 9-1-1 data.

\*\*8 agencies listed above are active in the network but not recorded in the data 9-1-1 network (4 police, 4 EMS).

Fire (51.66 percent of the network) ranks as the most prominent discipline in terms of number of participants (234). Police (27.81 percent) and EMS (18.98 percent) also represent sizable portions of the network. Only County Emergency Services and County 9-1-1 are listed on the 9-1-1 data base as emergency management agencies. As responders request additional mutual aid, other agencies such as neighboring counties, Region 13, PEMA, and FEMA would enter the network. These agencies represent a surge capacity as incidents transition from routine to large-scale.

Figure 15 reveals the composition of the complete network. It confirms, visually, the dense, tightly-coupled patterns of interactions found in the analysis above. Analyses of individual networks by discipline are included in the sections below.



**Figure 15: Diagram of Interacting Agencies, Allegheny County, Pennsylvania (Complete Network)**

## **6.5 KEY AGENCIES**

What agencies are central in the network? Which actors are critical in linking the network's subcomponents? Analysis of network data indicates that a number of county-level agencies, the County Police and Fire Marshal, in particular, play prominent roles in connecting the network as do several regional EMS agencies and a few large, municipal police departments.

### 6.5.1 Complete Network

The present study employs degree centrality as an indicator of activity with the assumption that activity indicates prominence in a network. An actor’s degree centrality is measured by the total number of other actors to which it is connected (Freeman 1979). Police, fire, and EMS agencies, on average, worked with 34.35 agencies (median 30.00) at some point during the seven months that data was collected in the 9-1-1 dispatch records, a considerable number, albeit with variability (SD 28.73). Table 26 presents the descriptive statistics for the complete network’s degree centrality scores. The wide range between the maximum number of partners (282) and the minimum (1) indicate considerable variance in terms of agencies’ activity. The network centralization measure (56 percent) depicts a tightly-coupled network.

**Table 26: Degree Centrality (Complete Network)**

	<b>Degree</b>	<b>NrmDegree</b>	<b>Share</b>
Mean	34.35	7.74	0.00
Std Dev	28.73	6.47	0.00
Sum	15286.00	3442.79	1.00
Variance	825.32	41.87	0.00
SSQ	892352.00	45265.81	0.00
Minimum	1	0.23	0.00
Maximum	282	63.51	0.02
Network Centralization = 56.03%			
Heterogeneity = 0.38%			
Normalized = 0.16%			
Median = 30.00			

An analysis of the individual degree centrality scores identifies several prominent agencies. Table 26 lists the top 10 most central actors in the complete network. Several units within the Allegheny County Police, including the detective unit (Degree 282, Nrm Degree 63.5)

and the photo lab (Degree 165, Nrm Degree 37.2), play active roles. County detectives working on scene with 282 other agencies (police, fire, and EMS) represent a major actor upon which other agencies rely.

The county fire marshal and the deputy (Degree 249, Nrm Degree 56.1) work on scene with a considerable number of departments as they investigate structure fires to determine cause. Shaler Township Police (Degree 125, Nrm Degree 28.2) and Northern Regional Police (Degree 120, Nrm Degree 27.0), two departments from the North Hills region of the county, rank high on the degree centrality list as do several regional (as opposed to municipal) EMS agencies: UPMC St. Margaret Paramedic Response Team (Degree 103, Nrm Degree 23.2), Ross-West View EMS (Degree 99, Nrm Degree 22.3), Lower Valley Ambulance (Degree 95, Nrm Degree 21.4), and Seneca Area EMS (Degree 94, Nrm Degree 21.2). Respondent 39 explained the regularity of EMS agencies crossing boundaries and responding with other agencies. “EMS, on a day to day basis, responds throughout a variety of communities to assist. [EMS] does not worry about geopolitical boundaries...”

Many of these prominent agencies are located in the North Hills region of the county. What makes this area more conducive to cooperation than others? The North Hills’ municipalities possess more first response agencies than other areas. The high volume of agencies within a compact geographic area decreases the distance and response times, which increases the opportunity to interact. The Shaler Police Department, for example, is located at the center of the area within easy access to many neighboring municipalities. Perhaps as a function of geography, the area exhibits a culture that values interorganizational cooperation. One of the only consolidated, regional police departments in the Commonwealth, Northern Regional, operates within the area. In addition, the Ohio Township Police contracts out its

services to several municipalities in the North Hills. With respect to EMS, most agencies operate under a client reciprocity agreement (introduced in Chapter 5).

Outside of the North Hills, another prominent agency, the Pennsylvania State Police (Degree 94, Nrm Degree 21.2), provides primary law enforcement services to three municipalities in Allegheny County, in addition to patrolling all limited access highways in Pennsylvania, conducting traffic investigations, and performing a number of other functions. The state police is, therefore, in a position to regularly interact with other agencies.

The absence of municipal fire departments among the top agencies is noticeable. Municipal fire departments, mostly volunteer, do not field the personnel to respond constantly to incidents. Fire-related incidents, also, occur less frequently than emergency medical or law enforcement activities. Not mentioned in the Table 27 is the County 9-1-1 which dispatches the vast majority of emergency calls and serves as the hub for information exchange in the network.

**Table 27: Prominent Actors by Degree Centrality (Complete Network)**

Agency Name	Discipline	Sector	Jurisdiction	Degree	NrmDegree	Share
County Allegheny - Detectives	Police	Public	County	282	63.5	0.0184
Allegheny County Deputy Fire Marshal	Fire	Public	County	249	56.1	0.0163
Allegheny County Fire Marshal	Fire	Public	County	249	56.1	0.0163
Allegheny County Photo Lab	Police	Public	County	165	37.2	0.0108
Shaler Twp	Police	Public	Municipal	125	28.2	0.0082
Northern Regional PD	Police	Public	Regional	120	27.0	0.0079
UPMC St. Margaret Paramedic Team	EMS	Nonprofit	Regional	103	23.2	0.0067
Ross-West View EMS	EMS	Public	Regional	99	22.3	0.0065
Lower Valley Ambulance	EMS	Nonprofit	Regional	95	21.4	0.0062
Seneca Area EMS	EMS	Nonprofit	Regional	94	21.2	0.0061

The prominent agencies mentioned above are well situated to disseminate information throughout the network. Also well situated are agencies that sit in between others, particularly



prominent actors. This type of position, or high betweenness in a network, provides opportunities for information access and control (Krackhardt 1992; Comfort and Haase 2006). These agencies can serve as brokers of information resources.

This type of position can be measured by the betweenness centrality statistic, “a measure of the number of times a[n] [actor] occurs on a geodesic” (Borgatti, Everett, and Freeman 2002). Freeman (1979) developed this measure “based upon the frequency with which a point falls between pairs of other points on the shortest or geodesic paths connecting them” (p. 221). In short, an agency with high betweenness sits in between many other agencies on the network graph. Table 28 presents the descriptive statistics for the complete network’s betweenness centrality. The average agency sits on 272.74 direct paths of communication (SD 1207.96). The agency with the highest betweenness measure, the County Police detective unit (17238.63), is a prominent actor.

**Table 28: Betweenness Centrality (Complete Network)**

	<b>Betweenness</b>	<b>nBetweenness</b>
Mean	272.74	0.28
Std Dev	1207.96	1.23
Sum	121367.00	123.41
Variance	1459171.00	1.51
SSQ	682432128.00	705.58
Minimum	0	0
Maximum	17238.63	17.53

Network Centralization Index = 17.29%

Degree centrality correlates, generally, with betweenness centrality; therefore, many of the same agencies appear in Table 29 that appear in Table 27. Table 29 presents prominent actors by betweenness. One agency that moved up in prominence from the degree centrality list,

the Pennsylvania State Police (1747.18), appears to be situated in a key role connecting various agencies on the local level.

**Table 29: Prominent Actors by Betweenness Centrality (Complete Network)**

Agency Name	Discipline	Sector	Jurisdiction	Betweenness	nBetweenness
County Allegheny - Detectives	Police	Public	County	17238.63	17.529
Allegheny County Fire Marshal	Fire	Public	County	12519.54	12.730
Allegheny County Deputy Fire Marshal	Fire	Public	County	12344.97	12.553
Allegheny County Photo Lab	Police	Public	County	4150.40	4.220
Northern Regional PD	Police	Public	Regional	3037.04	3.088
Shaler Twp	Police	Public	Municipal	2888.73	2.937
Pennsylvania State Police	Police	Public	State	1747.18	1.777
Jefferson EMS	EMS	Nonprofit	Regional	1538.07	1.564
UPMC St. Margaret Paramedic Team	EMS	Nonprofit	Regional	1415.71	1.440
Eastern Area Pre-Hospital Services	EMS	Nonprofit	Regional	1348.77	1.372

Another measure to identify prominent network actors is closeness centrality. Closeness centrality indicates the proximity (or closeness) of an agency to all other agencies in the network. Closeness indicates the reach an agency has within a system. Agencies seeking to coordinate activities may be well served in positions of high closeness as they have shorter paths to reach other organizations.<sup>23</sup>

An analysis of closeness centrality statistics confirms the prominence of county agencies, regional EMS agencies, and large municipal police departments. Table 30 displays the agencies with high normalized closeness and low farness. It reaffirms the prominent standing of the County Police, the Fire Marshal, Shaler Police, North Regional Police, and large regional EMS agencies.

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<sup>23</sup> “The farness of a vertex is the sum of the lengths of the geodesics to every other vertex. The reciprocal of farness is closeness centrality. The normalized closeness centrality of a vertex is the reciprocal of farness divided by the minimum possible farness expressed as a percentage” (Borgatti, Everett, and Freeman 2002).

**Table 30: Prominent Actors by Closeness Centrality (Complete Network)**

<b>Agency Name</b>	<b>Discipline</b>	<b>Jurisdiction</b>	<b>Sector</b>	<b>Farness</b>	<b>nCloseness</b>
County Allegheny - Detectives	Police	County	Public	608	73.0263
Allegheny County Deputy Fire Marshal	Fire	County	Public	644	68.9441
Allegheny County Fire Marshal	Fire	County	Public	645	68.8372
Allegheny County Photo Lab	Police	County	Public	729	60.9053
Shaler Twp	Police	Municipal	Public	783	56.705
Northern Regional PD	Police	Regional	Public	789	56.2738
UPMC St. Margaret Paramedic Team	EMS	Regional	Nonprofit	810	54.8148
Ross-West View EMS	EMS	Regional	Public	819	54.2125
Lower Valley Ambulance	EMS	Regional	Nonprofit	823	53.949
Allegheny County Investigator	Police	County	Public	825	53.8182

The degree, betweenness, closeness centrality measures indicate a relatively centralized, interconnected network. One method to identify possible weaknesses in a network is to spot cutpoints. “A cutpoint of a graph is a vertex whose removal increases the number of components” (Borgatti, Everett, and Freeman 2002). That is a cutpoint links a network’s subcomponents. Its removal will disconnect groups and reduce interconnectivity of a network. Analysis identifies only seven cutpoints. Geographically, the agencies are located toward the boundaries of the field study area and only connect relatively small subcomponents to the larger network. Table 31 identifies a relatively even mix of agencies as represented by discipline: fire, police, and EMS. The lack of a cutpoint linking large subcomponents underlies the density of the network.

**Table 31: List of Cutpoints by Discipline (Complete Network)**

<b>Agency Name</b>	<b>Discipline</b>	<b>Sector</b>	<b>Jurisdiction</b>
Northern Regional PD	Police	Public	Regional
Jefferson EMS	EMS	Nonprofit	Regional
Indiana Twp	Police	Public	Municipal
White Oak EMS	EMS	Nonprofit	Municipal
White Oak	Police	Public	Municipal
Neville	Fire	Nonprofit	Municipal
Aleppo	Fire	Nonprofit	Municipal
Logans Ferry #3 (Plum)	Fire	Nonprofit	Municipal

Another measure to identify agencies are agency-level structural holes statistics (effective size, efficiency, and constraint) that identify particularly sparse sets of relationships (Burt 1992). Structural holes are gaps in a network; more specifically they are the extent to which an agency's alters (or partners) are not connected. From an emergency management perspective, limited interconnectivity makes a network vulnerable to failure if central hubs fail. Agencies with sparsely-connect ego-networks are valuable in promoting information exchange as redundancy is limited.

Table 32 presents particularly sparse ego networks within the complete network, meaning the agencies with which an agency interacts are not particularly connected with each other. An agency with high structural hole values, therefore, serves a major role in connecting the system. Specifically, an evaluation of three measures—effective size, efficiency, and constraint—indicates that the same prominent agencies identified above (in the centrality analyses) play prominent roles in connecting otherwise disconnected agencies. County Police, the fire marshal, and Shaler Police, in particular, exhibit high effect sizes (see Table 32).

Constraint indicates the extent to which an ego's alters are connected to each other; the greater degree of interconnectivity, the greater the "constraint" on the ego (Burt 1992; Borgatti, Everett and Freeman 2002). Lower constraint scores indicate less interconnectivity. The

measure correlates inversely with effective size and efficiency. Structural holes occur noticeably in the large ego networks identified in the degree and betweenness centrality analyses. This finding bolsters the importance of these central hubs in connecting disparate agencies and subcomponents.

**Table 32: Structural Holes (Complete Network)**

Agency Name	Discipline	Sector	Jurisdiction	EffSize	Efficiency	Constraint
County Allegheny - Detectives	Police	Public	County	248.12	0.88	0.02
Allegheny County Deputy Fire Marshal	Police	Public	County	218.65	0.88	0.02
Allegheny County Fire Marshal	Police	Public	County	218.47	0.88	0.02
Allegheny County Photo Lab	Police	Public	County	136.27	0.83	0.03
Shaler Twp	Police	Public	Municipal	97.35	0.78	0.03
Northern Regional PD	Police	Public	Regional	90.58	0.75	0.03
Pennsylvania State Police	Police	Public	State	77.04	0.82	0.04
UPMC St. Margaret Paramedic Team	EMS	Nonprofit	Regional	74.38	0.72	0.04
Ross-West View EMS	EMS	Public	Regional	65.75	0.66	0.04
Lower Valley Ambulance	EMS	Nonprofit	Regional	65.57	0.69	0.04

Clique analysis is another method by which to identify prominent, interconnected agencies in the complete network. Scott (2005) defines a clique as “a sub-set of points in which every possible pair of points is directly connected by a line and the clique is not contained in any other clique” (p. 114). The minimum size for a clique is three. UCINET analyzes clique overlap. Depending on the complexity and interconnectivity of a network, several configurations of cliques may exist.

Analysis of cliques within the police, fire, and EMS networks indicates that the field study area is particularly interconnected. There are 690 maximally complete subgraphs in the police network, 421 in fire, and 198 in EMS. The cliques range in membership from the largest (14) to the smallest (3). Of the 444 agencies active in the network, 229 are represented in at least

one clique. The Ross Township Fire Police, which participates in a number of fire, police, EMS-related activities, is found in the most cliques (96). Respondent 24, a police chief, indicated his department's reliance on fire police. "We use them extensively..." for traffic control, event management, etc. They were "originally designed to direct traffic at the scene of a fire... that's been expanded over the years."

The fact that 108 agencies participate in at least 10 cliques or more indicates high levels of interconnectivity. The average of 7.42 cliques per agency also demonstrates dense patterns of interaction. However, wide variance (SD 14.156) suggests variability in the degree to which agencies are integrated into the complete network.

The section above identifies several key actors within the network. In terms of geographic centrality, size, and available resources to share, one municipality is noticeably disengaged from the system: the City of Pittsburgh. The existing network data, supported by anecdotes from the semi-structured interviews, characterize the city as a relatively absent player with respect to response. Pittsburgh, which sits at the geographic center of the county and borders thirty-three municipalities, responds to emergencies in conjunction with only a handful of outside agencies. While the police and EMS are somewhat engaged with others (the police interacted with eleven outside municipal police departments according to the county 911 data), the fire department only operates within the city and the Borough of Wilksburg.<sup>24</sup> They do not request mutual aid from others nor do they offer it.

Pittsburgh's public safety agencies interact with county organizations including the fire

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<sup>24</sup> The City of Pittsburgh Fire Department provided mutual aid occasionally for the Wilksburg Fire Department. In March 2011, the two departments formally merged with Pittsburgh officially taking over operational responsibilities.

marshal, the county police, and the Port Authority police. They appear to have created a direct link with the county apart from their neighbors. Pittsburgh's involvement within the system forces other departments to adapt and work around their metropolitan center, relying on county resources instead of their resourceful, but reluctant neighbor.

One explanation of Pittsburgh's apparent policy decision not to extend mutual aid on a regular basis could be their perception of need. As a set of large, resourceful departments, city officials may not recognize the need to work with others on a regular basis. The city possesses the capacity internally to respond effectively to the vast majority of incidents. In the absence of need, there is no pressing imperative for the city to expend their resources to the benefit of their neighbors when, in their estimation, future interactions will not benefit the city.

### **6.5.2 Police Network**

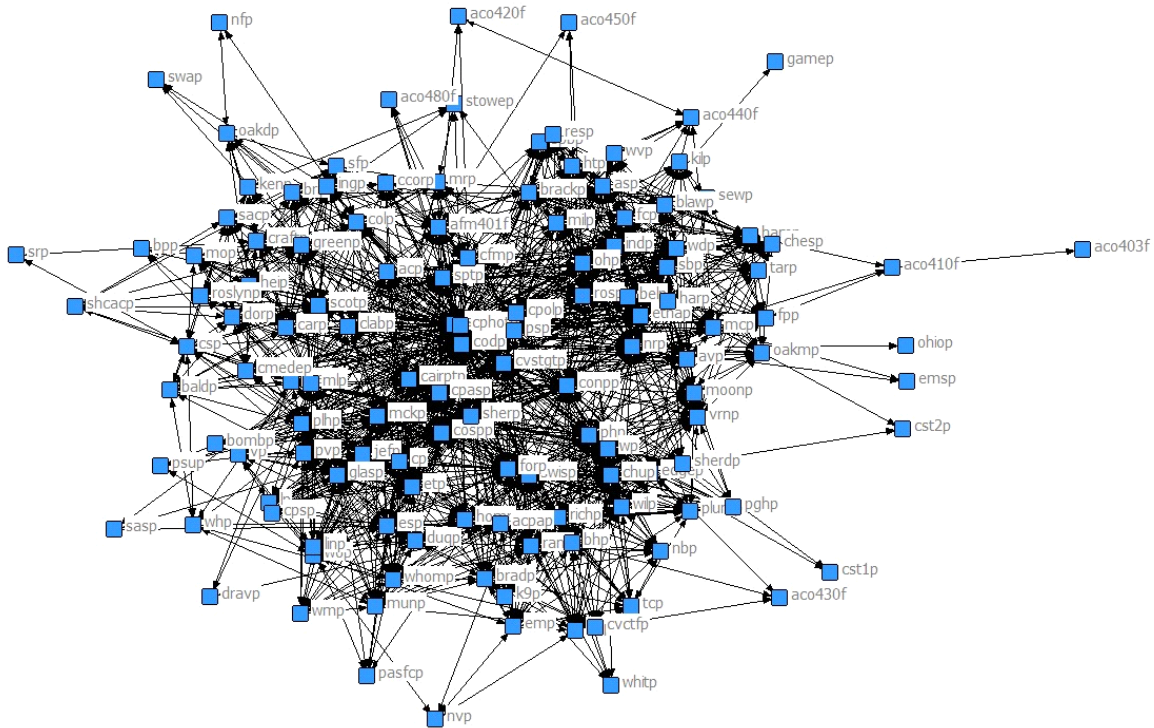
Network analysis of just the police network data was conducted to explore the structure of the system. Figure 16 models what is a densely-clustered police network.<sup>25</sup> Several county agencies sit at the center of the network. Municipal reliance on county assets helps to explain the high level of integration apparent between county and municipal-level agencies. Six of the top ten active police entities, as presented in Table 33, are county-based. The County Police detective unit (Degree 87, Nrm Degree 66.41), the photo lab (Degree 63, Nrm Degree 48.09), and three district barracks demonstrate considerable activity within the network.<sup>26</sup> The state police

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<sup>25</sup> Lists of active police, fire, and EMS agencies (and their acronyms) are located in the appendices.

<sup>26</sup> The network data demonstrate that county police personnel come into contact with a large number of other agencies. These county personnel provide specific resources and services related to law enforcement. The

(Degree 41, Nrm Degree 31.30) demonstrate comparatively less intra-disciplinary cooperation, as the agency interacts with more non-police entities (53) than police (41). This inter-disciplinary activity most likely takes place in areas with low concentrations of municipal police where the state police interact more with fire and EMS agencies.



**Figure 16: Diagram of Interacting Police Departments, Allegheny County, Pennsylvania**

**Isolates and pendants removed**

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extent which the county police strengthen the system’s resilience or integrate other agencies together with respect to emergency management is less clear. The county police are in a position to use their access to coordinate a more robust system, however.



**Table 33: Prominent Agencies by Degree Centrality (Police Network)**

Agency Name	Sector	Jurisdiction	Degree	NrmDegree	Share
County Allegheny - Detectives	Public	County	87	66.41	0.030
Shaler Twp	Public	Municipal	64	48.86	0.022
Allegheny County Photo Lab	Public	County	63	48.09	0.022
County Sheriff	Public	County	61	46.56	0.021
County Allegheny District 3 (North Park)	Public	County	57	43.51	0.020
Northern Regional PD	Public	Regional	55	41.98	0.019
County Allegheny District 2 (South Park)	Public	County	52	39.69	0.018
County Allegheny District 1 (Airport)	Public	County	43	32.82	0.015
Penn Hills	Public	Municipal	42	32.06	0.014
Swissvale	Public	Municipal	42	32.06	0.014

Table 34 presents the descriptive degree centrality statistics for the police network. The network centralization score (50.29 percent) indicates a highly-centralized structure, especially in comparison with the EMS (24.67 percent) and fire (12.56 percent) networks. Again, the prevalence of county-based agencies connecting departments throughout the field study area helps to explain this network centralization.

**Table 34: Degree Centrality (Police Network)**

	Degree	NrmDegree	Share
Mean	22.121	16.886	0.008
Std Dev	15.189	11.595	0.005
Sum	2920	2229.008	1
Variance	230.713	134.44	0
SSQ	95048	55386.051	0.011
MCSSQ	30454.061	17746.088	0.004
Euc Norm	308.299	235.342	0.106
Minimum	1	0.763	0
Maximum	87	66.412	0.03

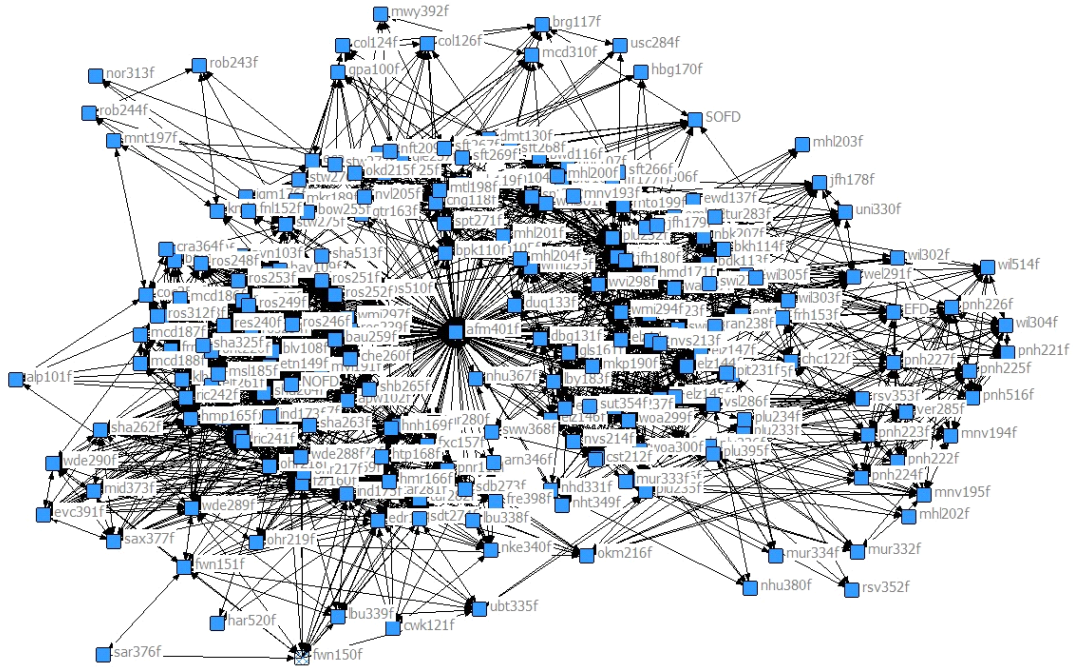
Network Centralization = 50.29%  
Heterogeneity = 1.11%  
Normalized = 0.36%

### 6.5.3 Fire Network

Fire chiefs focus their operations on local, neighborhood incidents with the exception of those departments that field rapid intervention teams and other specialized services and equipment such as foam trucks, ladder trucks, etc. These special operations teams and specialty pieces of equipment offer departments opportunities to span regional boundaries. Figure 21 models the clusters of “neighborhood-centered” groups that form as a result of joint response activities. The center node, the County Fire Marshal’s Office (afm401f), demonstrates how a county asset has the potential to link otherwise disparate subcomponents.<sup>27</sup> Figure 17 models the fire network without the fire marshal’s office, which more clearly illustrates the clustering of delineated groups. A visual inspection confirms the underlying logic of the small-world model that agencies sharing professional contacts are more likely to work with each other.

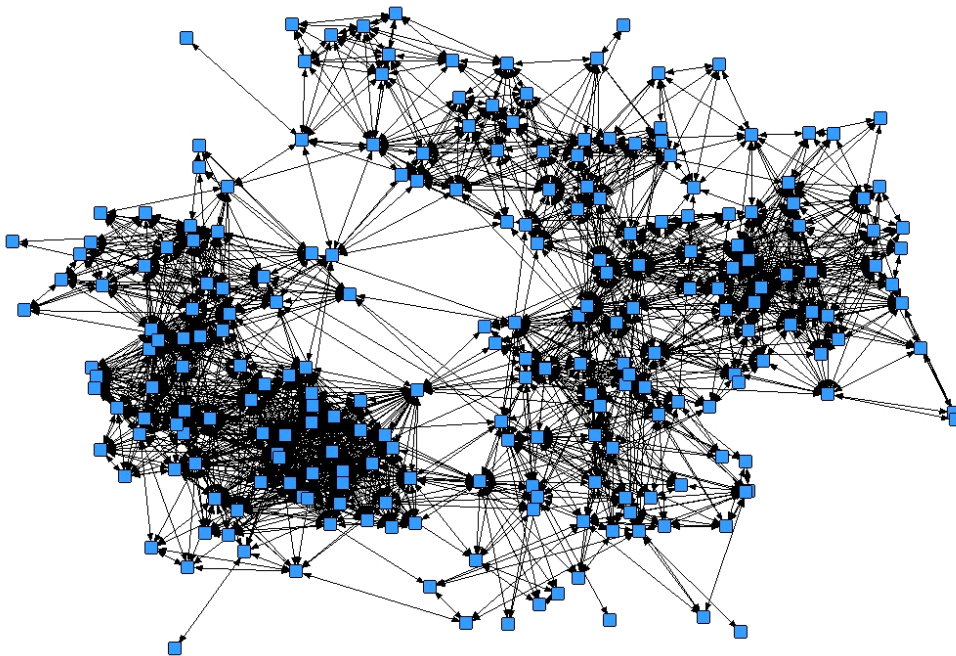
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<sup>27</sup> While the county fire marshal has a legal role and authority limited to identifying the cause of fires, the former director who also administered county emergency services was able to use his multiple roles and access to multiple agencies to help integrate the system.



**Figure 17: Diagram of Interacting Fire Departments, Allegheny County, Pennsylvania**

**Isolates and pendants removed**



**Figure 18: Diagram of Interacting Fire Departments (County Fire Marshal Removed)**

**Isolates and pendants removed**

**County fire marshal's office removed**

Table 35 lists the most active fire departments in terms of intra-disciplinary degree centrality.<sup>28</sup> Eight of the 10 agencies are geographically located in the North Hills region of Allegheny County. Chapter 7 demonstrates that geographic location influences degree centrality. The two agencies that make this list outside of the North Hills area (Pleasant Hills and Homestead) operate rapid intervention teams (RIT), which increases their opportunities for interaction. RIT teams specialize in firefighter rescue and safety during response operations. Noticeably absent from the active agencies in Table 39 are paid departments. This absence is explored in Chapter 8.

**Table 35: Prominent Agencies by Degree Centrality (Fire Network)**

Agency Name	Sector	Jurisdiction	Degree	NrmDegree	Share
Undercliff (Shaler Twp)	Nonprofit	Municipal	47	20.09	0.011
Homestead	Nonprofit	Municipal	47	20.09	0.011
Pleasant Hills	Nonprofit	Municipal	44	18.80	0.011
Hampton	Nonprofit	Municipal	43	18.38	0.010
Etna	Nonprofit	Municipal	40	17.09	0.010
Millvale	Nonprofit	Municipal	40	17.09	0.010
Ross Twp Fire Police	Nonprofit	Municipal	40	17.09	0.010
Ross Twp Fire Marshal	Public	Municipal	39	16.67	0.009
Rural Ridge (Indiana Twp)	Nonprofit	Municipal	37	15.81	0.009
Elfinwild (Shaler Twp)	Nonprofit	Municipal	37	15.81	0.009

Table 36 indicates that fire departments, on average, interact with fewer agencies (Degree 17.86 Nrm Degree 7.634) than do police (22.12). Fire, as mentioned above, is not as centralized (12.56 percent) as the EMS (24.67 percent) or police (50.29 percent) networks. The lack of centrality is reaffirmed in the regional “neighborhood” groups into which fire departments cluster.

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<sup>28</sup> The County Fire Marshal’s office is excluded from analysis of municipal agencies.

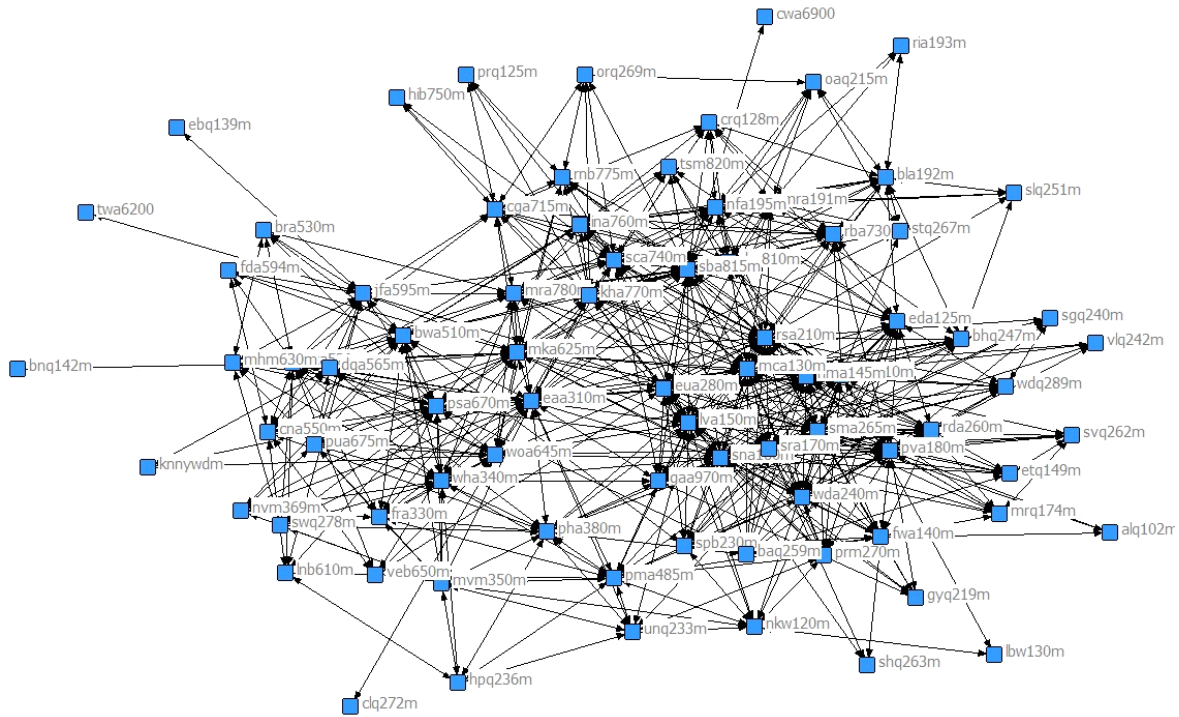
**Table 36: Degree Centrality (Fire Network)**

	<b>Degree</b>	<b>NrmDegree</b>	<b>Share</b>
Mean	17.864	7.634	0.004
Std Dev	10.126	4.327	0.002
Sum	4198	1794.017	1
Variance	102.535	18.726	0
SSQ	99088	18096.281	0.006
MCSSQ	24095.643	4400.548	0.001
Euc Norm	314.782	134.522	0.075
Minimum	0	0	0
Maximum	47	20.085	0.011

Network Centralization = 12.56%  
Heterogeneity = 0.56%  
Normalized = 0.14%

#### **6.5.4 EMS Network**

Figure 19 models the interaction between EMS agencies demonstrating a relatively tightly-connected system. Several agencies clearly operate at the core of this network. Table 37 shows a mix of agencies by sector (nonprofit and public) and by jurisdiction (regional and municipal) among the most central EMS agencies. The most active agency, UPMC St. Margaret Paramedic Team (Degree 33, Nrm 41.25), sits in a position as a hospital-based team that crosses geographical boundaries in order to assist other agencies. Private agencies are noticeably absent from the list of most active agencies. Also, all prominent agencies listed in Table 37 are Advanced Life Support (ALS), which reaffirms the role of QLS and BLS agencies as local responders that augment ALS capacity, not regional agencies that regularly cross jurisdictional boundaries.



**Figure 19: Diagram of Interacting EMS Agencies, Allegheny County, Pennsylvania**

**Table 37: Prominent Agencies by Degree Centrality (EMS Network)**

Agency Name	Type	Sector	Jurisdiction	Degree	NrmDegree	Share
UPMC St. Margaret Paramedic Team	ALS	Nonprofit	Regional	33	41.25	0.030
Seneca Area EMS	ALS	Nonprofit	Regional	33	41.25	0.030
Lower Valley Ambulance	ALS	Nonprofit	Regional	32	40.00	0.029
McCandless-Franklin Park EMS	ALS	Public	Regional	32	40.00	0.029
Ross-West View EMS	ALS	Public	Regional	31	38.75	0.028
Eastern Area Pre-Hospital Services	ALS	Nonprofit	Regional	30	37.50	0.027
Shaler Area EMS	ALS	Nonprofit	Municipal	29	36.25	0.026
Hampton Twp EMS	ALS	Nonprofit	Municipal	28	35.00	0.025
Southbridge EMS	ALS	Nonprofit	Regional	28	35.00	0.025
McKeesport EMS	ALS	Public	Regional	27	33.75	0.024

Table 38 presents the average degree centrality statistics for the EMS network. The average number of partners was 13.75 (SD 8.99); considering that the EMS network consists of far fewer agencies than fire and police, the lower degree centrality is understandable. The range with a high of 33 and low of 1 illustrates the variability in activity.

**Table 38: Degree Centrality (EMS Network)**

	<b>Degree</b>	<b>NrmDegree</b>	<b>Share</b>
Mean	13.753	17.191	0.012
Std Dev	8.985	11.231	0.008
Sum	1114	1392.5	1
Variance	80.729	126.139	0
SSQ	21860	34156.25	0.018
MCSSQ	6539.062	10217.284	0.005
Euc Norm	147.851	184.814	0.133
Minimum	1	1.25	0.001
Maximum	33	41.25	0.03

Network Centralization = 24.67%  
Heterogeneity = 1.76%  
Normalized = 0.53%

## 6.6 CONCLUSION

This chapter identifies the composition, structure, and key actors within an emergency management network over a seven-month period. Findings demonstrate that the field study area exhibit both small-world and scale-free tendencies, which indicate a tightly-clustered system interwoven by several core actors. I label this architecture as a “neighborhood-centered network” for emergency management and public safety.

Analysis of several network measures (centrality, structural holes, etc.) identifies several county, police, and EMS agencies as core actors. Fire departments appear to be more localized in their patterns of interaction. Discipline and levels of government provide attributes to explore the components of administrative structure that influence whether agencies cooperate. I address those issues in the next chapter.

## **7.0 COMPONENTS OF ADMINISTRATIVE STRUCTURE THAT INFLUENCE COOPERATION**

Chapters 5 and 6 map the patterns of interaction that occur in the emergency management system. Interaction creates opportunities to share information and promote organizational learning within an interdependent system. As an organization learns, it may develop new strategies for action and communicate those strategies to others. As these ideas diffuse and are adopted, a type of community learning takes place where behavior changes overtime.

Whether organizations cooperate depends on the decisions of individual personnel. Their decisions are heavily influenced by the available information from across organizational boundaries (Comfort 1994). Communication then becomes the driving force that shapes and constrains the decision to cooperate (Luhmann 1989). As organizations interact with one another and accrue experiences, they build a common knowledge base.

These knowledge systems (and the decision to cooperate) are influenced by various components of administrative structure and process of different sizes and importance. Components of structure include organizational goals, designs, resources, and the rules that shape and constrain action. Structure also encompasses the technical infrastructure used to store and communicate information. Components of process include organizational culture, leadership, and interpersonal relationships. Decision makers recognize these components at different rates and in different ways. Operating within a heterogeneous nested set of agencies,



organizations exhibit varying resources, experiences, and priorities. What is vital to one agency may not be to another at any given point. What is constant is that decision makers are making judgments about the professional confidence of the people with whom they interact. What influences these judgments and to what extent do they influence collective action?

Chapter 7 identifies the components of administrative structure affecting interorganizational cooperation. Analysis of semi-structured interviews clearly demonstrates that similar problems and goals create the opportunity for collective action. This chapter also identifies the existence of organizational competition that inhibits cooperation.

Once common cause is established, geographic and conceptual proximity increases the likelihood for collective action as the likelihood for shared problems, interaction, and feedback increases. Urgent need and proximity heavily influence the decision to cooperate. When these conditions are met, it takes significant disincentives to inhibit collective action. Chapter 9 explores these factors, namely low professional competence.

Influential actors from the federal to the municipal level of government create rules that either promote or inhibit collective action. In particular, state legislation reducing the liability concerns of emergency managers is a positive factor. In addition, findings demonstrate that policies at the county and municipal levels place limitations on who has access to the information infrastructure and when. Analysis of semi-structured interviews indicates that the field study area's information infrastructure, while on a positive trajectory in reducing information asymmetry, limits the extent to which some agencies receive and exchange data critical to decision making regarding collective action. County 9-1-1 and emergency management serve as major hubs for information within the system, but they also restrict

situational awareness by assigning different radio frequencies to neighboring agencies (in certain cases).

## **7.1 PROBLEMS AND GOALS**

Analysis of the semi-structured interviews supports Gray (1989), Bardach (1998) and Cigler (1999) who suggest that shared problems create the opportunity for cooperation. Shared and/or interrelated problems provide an impetus for collective action. Decision makers, in the face of common problems, identify complimentary goals that lead to action. The recognition of shared risk, certain focusing events, and fiscal stress represent common problems that prompt cooperation.

### **7.1.1 Vulnerability**

The present study's findings reinforce the fundamental assumptions of the extant literature (Mileti 1999; Comfort 1999) that the identification of vulnerability to any number of risks prompts the formation of strategies for action, including collective action, that are intended to mitigate against potential negative consequences. Chapter 4 identifies the field study area's major vulnerabilities (social, built, and geophysical) and Chapter 5 argues that agencies engage in both formal and informal patterns of risk assessment that justify either action or inaction depending on their recognition of need. The recognition of risk and vulnerability increases the likelihood that agencies distinguish the utility of cooperation. As agencies identify potential benefits of collective action, they are far more likely to pursue it.

### **7.1.2 Focusing Events**

The present study argues that emergency-response incidents lead to collective action and represent focusing events that generate demands on personnel, resources, and time. Two types of focusing events (external and internal), identified through the analysis of semi-structured interviews, motivate agencies to work together. Focusing events serve as defining moments in time in which decision makers recognize vulnerabilities and/or opportunities for action. A specific type of focusing event demonstrated in the field study area is the response to emergency incidents. These events direct attention to specific problems (and external demands) and can lead to cooperation between organizations (Comfort 1999; Cigler 1999). Emergency response incidents in progress represent focusing events that generate demands on a regular basis. As the capacity of a responding agency is overwhelmed, mutual aid agencies and agencies from other levels of government are requested for support.

An agency does not have to directly participate in a focusing event to take away lessons. External focusing events represent incidents in which agencies do not directly engage, but from which they draw conclusions that influence their future decisions. Respondents commonly cite the 9/11 terrorist attacks as an external focusing event. Another commonly cited incident, the school shooting in Columbine, Colorado, in 1999, prompts interorganizational cooperation between first responders and school districts in the field study area to prevent school violence. In addition to these events of national prominence, respondents from the police discipline commonly refer to several incidents in which lone-responding officers were shot during traffic stops. These incidents create and reinforce perceptions of the need for interorganizational cooperation.

Internal focusing events encompass direct experiences that alter organizational perspectives and motivate action, including collective action. For police personnel, a murderous shooting spree that crossed municipal borders in the late 1990s drew attention to the need for timely, accurate information exchange in the face of a deadly threat. Respondents from the fire discipline cite several structure fires in which their capacity was overwhelmed and they, as a result, recognized the indispensability of mutual aid.

In the field study area, several focusing events, both external and internal, motivated departments in a specific geographic area to create a regional police working group. The Columbine incident and the aforementioned trans-municipal shooting spree first led a group of police chiefs to recognize the necessity of “inter-municipal police response” (Respondent 51). They began meeting to explore possible points of collaboration. “Then everything was crystallized during the events of 9/11,” according to Respondent 51. “Once the concept [of interagency cooperation] took hold, both purpose and organizational inertia were overcome and the program basically picked up its own head of steam and is where it is today because of that history.” Presently, the regional group has seventeen members and several pieces of shared specialty equipment.

### **7.1.3 Fiscal Stress**

Resource dependence theory argues that agencies with limited resources will pursue the assets needed for survival (Pfeffer and Salancik 1978). In circumstances where organizations experience fiscal stress or anticipate stress, cooperation offers a strategy to ensure organizational survival and maintenance (Cigler 1999). Past research indicates that fiscal stress positively correlates with intermunicipal cooperation (Morgan and Hirlinger 1991; Sonenblum, Kirlin, and

Ries 1977; Joassart-Marcelli, and Musso 2005). Analysis of semi-structured interviews suggests that fiscal stress (at certain levels) prompts cooperation. The “Needs of the Organization” section below identifies the thresholds at which fiscal stress encourages cooperation in the field study area.

In the recognition of shared problems, agencies develop goals attainable through action, sometimes collective action. These goals range from espoused institutional missions such as protecting life and property to organizational maintenance and survival. Chapter 4 and 5 explore some of the goals driving operations. Mission-oriented goals such as improving the effectiveness of operations and ensuring service continuity prompt some agencies to interact.

Organizational maintenance goals, such as cost savings, prompt others to work together. Extant literature focuses on the positive role that cost savings plays in promoting cooperation (Sonenblum, Kirlin, and Ries 1977; Stein 1990; Hamilton 1999; Hodge 2000; Post 2004). Cost savings, according to several respondents, is a priority to many agencies in the field study area. Joint and coordinated purchasing (while limited) is clearly intended to achieve the goal of cost reduction.

While joint response reduces the costs of additional personnel and equipment, few define mutual aid as a cost saving activity, but rather a mission-driven imperative to protect life and property. Respondents indicated a desire to improve the efficacy of response through mutual aid, which corresponds with the desire to improve the quality of public goods and/or services hypothesis (Stein 1990; Thurmaier and Wood 2002; Post 2004).

Federal and state grants, state mandated programs (such as the Act 35 municipal planning directives) and training opportunities made available through state and county assets are intended to create minimum standards of performance across jurisdictions. The objective of service

continuity across jurisdictions helps to explain state and county involvement, according to state and county-level respondents. However, on the municipal level, respondents do not indicate that service continuity [as Ugboro, Obeng, and Talley (2001) perceive it] motivates municipal collective action.

## **7.2 THE NEEDS OF THE ORGANIZATION**

“I think the biggest obstacle [to interorganizational cooperation] is to have a need” (Respondent 39).

The definition of problems and goals shape and constrain strategies for action. Action places demands on organizational resources. In the field study area, commonly needed resources include manpower, equipment, specialized services (and expertise), money, and time. When emergency managers recognize these needs, they are more likely to enter into cooperative relationships. The ability and willingness to recognize need differs across agencies as does the actual need itself. It is the alignment of need and the recognition of need with the opportunity to cooperate that facilitates collective action. “Getting people to understand why we need to do these kinds of drills... That’s the challenge we face,” Respondent 42 stated, speaking to the inability or unwillingness of agencies to recognize the need for joint preparedness activities.

As need differs across agencies, so does the level of urgency that decision makers face. An emergency situation, dispatched by county or local 9-1-1 personnel, offers an urgent pronouncement of need. Respondent 38 cited an example that facilitated cooperation. “The shooting in Collier Township where 15 people were shot at the health club... There were a

dozen services who jumped in on that and cooperated very well and worked together extremely well. Services that don't even work together on a day-to-day basis." On the other hand, low levels of urgency (or no urgency at all) reduce the probability of collective action. A FEMA flood map, for example, represents a pronouncement of need, but not with the same level of urgency and not with the same directness of a communication as from a county 9-1-1 dispatcher.

### **7.2.1 Manpower**

"When you have a 10-person police department, you barely have the ability to put people in patrol cars and go out and answer calls" (Respondent 21).

"Manpower is becoming scarce. Volunteerism is becoming a thing of the past. And the ability to sustain yourself... is becoming a thing of the past. Mutual aid is becoming prevalent in communities because of the rising costs of equipment and the lack of manpower" (Respondent 13). This comment, from a police chief, speaks to the declining rate of volunteer firefighters statewide (Pennsylvania General Assembly 2005). At the first responder level, chiefs cite manpower as a driving force that prompts interorganizational cooperation (nine fire chiefs, nine police chiefs, and one EMS director). In all, 64.29 percent of the police chiefs interviewed and 50.00 percent of the fire chiefs identify available manpower as a key factor influencing collective action.

The inability to muster adequate levels of staffing, either because of fiscal stress (police and EMS), the availability of volunteers (fire), or restricted staffing in general (police and fire) limits agencies' ability to adequately respond to emergency incidents independently. The lack of manpower, therefore, compels emergency managers to request mutual aid.

Analysis of semi-structured interviews indicates that many fire departments are occasionally unable to muster sufficient crews for fire calls. Fielding crews for daytime incidents, in particular, presents challenges for even large volunteer departments. “What’s the obstacle [to mutual aid]? Today it is daylight fire calls. Everybody is very light on manpower on daylight. Not only our company but all of the companies in the area” (Respondent 16). This comment echoes sentiments from many service chiefs. EMS agencies experience the same problem. “You just don’t know whether or not [fire departments] are going to muster up the personnel to get there. The coordination isn’t the problem. The unknown is whether [the fire departments] are going to be able to get there” (Respondent 35).

Why the inability to field daylight crews? “What used to help the volunteer fire service in Pennsylvania and Allegheny County in particular was the shift work. A lot of millworkers. A lot of heavy industry. There were plenty of people around during the day and those people used to volunteer...” (Respondent 17). Respondent 9 also noted the change in available volunteers and indicated how his agency adjusted (through interorganizational cooperation) to meet the needs of his community. “Most of the volunteers... work daylight hours. Now [our neighbor] comes automatically [during the day] because we never know what we are going to get...” (Respondent 9). This comment is indicative of a common strategy of requesting automatic aid during the day from other departments.

Some communities have dealt with the shortage in manpower by hiring part-time, paid personnel during the day. Others release their public works employees during fire calls. Some police and EMS agencies employ cross-trained personnel and permit their participation in fire suppression while on the clock. Most chiefs, however, like Respondent 9, still depend on other departments for manpower.



The lack of manpower is not unique to the fire discipline. Police, like the municipalities they serve, experience fiscal stress, which limits the number of officers on any given shift. Respondent 26, a police chief in a smaller municipality, described his limited fiscal resources. “I am down two men and [the municipality] won’t replace them. They cut my budget by about 15 percent overall... It hasn’t been a good year so far.” Small municipalities, in general, are unable to field large numbers of police even in strong economic environments. In the face of perpetual constraints on resources, many municipal police departments routinely rely on mutual aid, at least, during certain high risk incidents. Respondent 22 described one example, “[Our neighbor] will [usually] have one police officer out on patrol. One! If he or she gets on the radio and they’ve got a gunman [or some other incident] and they don’t answer our dispatcher, [our] shift sergeant will use command authority to send an officer down there [automatically].”

In all, respondents indicate that sufficient manpower, sometimes too much, is a necessary operational objective. “Two or three police officers on a shift in a small town almost always can handle the issue. But when something arises when they are overpowered, out manned, or outgunned, it is better to have more help available and on scene than not to have enough at all” (Respondent 23).

## **7.2.2 Specialized Equipment, Services, and Multiagency Operations Teams**

Several specialized services, pieces of equipment, and multi-agency operational teams encourage cooperation and integrate several agencies into a larger response system (see Chapter 5’s section 5.2.3.6 on response). With these pieces of equipment and service teams comes operational expertise. Agencies request these assets based on their recognition need.

Agencies vary in the levels of equipment, training, and services offered. For example, volunteer fire departments, depending on the size of their municipality and level of resources, operate with limited resources. “On the volunteer side, outside of a select few, nobody really runs more than two engines out of the same station” (Respondent 2). This comment indicates that most large-scale incidents likely will overwhelm an individual agency’s capacity of most fire departments. In that case, departments request mutual aid or pre-assign automatic aid requests for certain incidents, i.e. structure fires, etc. The reality for agencies is that “the cost of equipment has increased... Our fundraising capacity hasn’t kept pace with the increase in equipment costs and neither has the contributions...” (Respondent 50). Adjusting to limited resources, agencies increasingly rely on mutual aid (and specialized equipment and services) to accomplish their operational tasks.

Respondents indicated that available equipment influences their decision regarding with whom to work. “I may have replaced a company with another department who just purchased a new piece of equipment” (Respondent 12). Other respondents indicate that they prioritize their mutual aid requests (run cards) based on available equipment, services, and operational teams, such as rapid intervention capabilities.

What other types of specialized services, equipment, and multi-agency operational teams help to promote collective action? Table 39 reveals the specialized equipment that facilitates interorganizational cooperation as identified during the semi-structured interviews. Types of assets vary by discipline and types of incidents. Police, according to Table 39, share several pieces of equipment. All-terrain vehicles and aviation assets are more likely to be requested during suspect apprehension, for example. Boats, predictably, are useful in river rescue situations. EMS agencies request mass casualty kits during some large-scale accidents. All fire

assets listed in Table 43 are useful depending on the type and severity of fire incident. Foam trucks for fire suppression appear to be increasingly common as “foam is useful for industrial types of fires, tanker rollovers, diesel, and gas [incidents]” (Respondent 17). Respondent 9 lauded foam and explained how his agency came to request it from an agency in relative close proximity:

We had a situation where the structure collapsed [and] we were in there for hours just dumping water on it and [the water] was not getting down where it was burning. We would get it as best as we could and left... After a couple of hours the neighbors called back because it was burning again. So we finally asked [the agency with the foam] to show us what [their] truck did. And they came and put a blanket of foam over everything and that was it. And it was like wow why didn't we do this sooner.

**Table 39: Specialized Pieces of Equipment that Facilitate Interorganizational Cooperation**

<i>Police</i>	<i>Fire</i>	<i>EMS</i>
All-terrain vehicles (ATV)	Aerial trucks	Automated external defibrillators (AED)*
Armored vehicles	Boats*	Bariatric stretchers (heavy weight)
Auto license plate recognition devices (ALPR)	Fire engines	Boats*
Automated external defibrillators (AED)*	Foam trucks	Ladders*
Aviation assets	Heavy rescue vehicles	Mass casualty kits
Ballistic shields	Ladder trucks	Stokes baskets
Bicycles	Ladders*	
Boats*	Lights	
Gas masks	Mobile EOC	
GPS for crime/traffic scene reconstruction	Portable air cascade units	
HAZMAT gear	Tanker trucks	
Ladders*	Thermal imaging cameras	
Motorcycles		
Munitions		
Night vision goggles		
Snake inspection cameras		
Telescopic cameras		

\* Multiple disciplines

Table 40 presents several specialized services that facilitate interorganizational cooperation. Chapter 5 describes how County Police contribute to municipal law enforcement

efforts by leading homicide and most violent crime investigations. That type of detective work requires specific skill sets, expertise, time, and resources. The County Police are able to achieve an economy of scale in the provision of those services. “We rely on county homicide because they are well-versed, they are very good” (Respondent 25).

In terms of frequency of interaction, semi-structured interviews indicate that sharing K-9 units is a common activity. K-9s are deployed for several types of incidents including bomb detection, drug detection, search and rescue activities, and suspect apprehension. Female officers conducting searches is also a common request between police departments. Respondent 22 explains why departments stress the need for female officers to conduct searches on female suspects:

Now a male may search a female but the Supreme Court has ruled many times, they’ve said all searches must be reasonable under the Fourth Amendment. And in order to be reasonable, it would be better to have a same sex person conduct the search. So if that person is remotely available, you better darn well make an effort to get them. And if the search is absolutely necessary and you can’t wait, you can do it, but it’s better to have a female do it. We send our female officers here and there and everywhere for search inspections.

In terms of the fire discipline, rapid intervention teams provide a commonly requested service (as identified in Chapter 5). Fire police and rescue teams also facilitate interorganizational cooperation. EMS work together and with fire departments during firefighter rehabilitation. Emergency management activities often cross municipal boundaries with respect to urban and wilderness search and rescue and HAZMAT response.

Specialized services and equipment encourage cooperation during other types of activities in addition to response. The desire to familiarize personnel with a neighbor’s specialized equipment and services leads to training activities. “A lot of it has to do with specialties and specific pieces of equipment. We might need to work with another truck

company and get to know their procedures” (Respondent 12). The desire to improve internal specialized services promotes training between agencies across spatial distance. “[Our new training partners] are too far way to mutual aid with on response, but they have a lot of the same interests like rescue. We will cross pollinate between these two other municipalities” (Respondent 5).

**Table 40: Specialized Services that Facilitate Interorganizational Cooperation**

<i>Police</i>	<i>Fire</i>	<i>EMS</i>	<i>Emergency Management</i>
Computer forensics	Technical rescue*	Firefighter rehab	Urban search and rescue
Electronic surveillance	Fire police	Technical rescue*	HAZMAT teams
Homicide investigations	Forcible entry		Wilderness search and rescue
K-9	Rapid Intervention Team (RIT)		
Searches by female officers	Rescue		
SWAT			
Technical rescue*			
Violent crime investigations			

\* *Multiple disciplines*

Semi-structured interviews identified several multiagency operations teams (or task forces) organized to facilitate collective action in order to address specific problems. The South Hills Area Council of Governments police advisory group and the North Hills area chiefs’ group both field critical incident response teams (CIRT) that serve a similar role as SWAT (Special Weapons Assault Team). EMS agencies also participate in police CIRT. Police departments work together in several DUI task forces, the county district attorney’s narcotics task force, the commercial vehicles task force, and the state police’s computer crimes task force. All three disciplines (EMS, fire, and police) play some role in technical rescue teams (TRT).

Region 13 and County Emergency Services (specifically through County 9-1-1), according to respondents, serve as a central hub for information regarding available resources.

Many agencies learn of available resources during response to an incident via communication with the 9-1-1 dispatcher.

Many agencies learn of available resources from past incidents and informal relationships with other agencies. Respondent 13 indicated that “if you need a piece of specialty equipment on scene to work a problem, it’s better to have cooperation beforehand.” Agencies that recognize what resources are available, understand their functionality, and know who to call (and when) improve the speed and efficacy of their operations. “It’s a fore-knowledge that the resource exists even before the incident” that improves response and “communication on the fly” (Respondent 56).

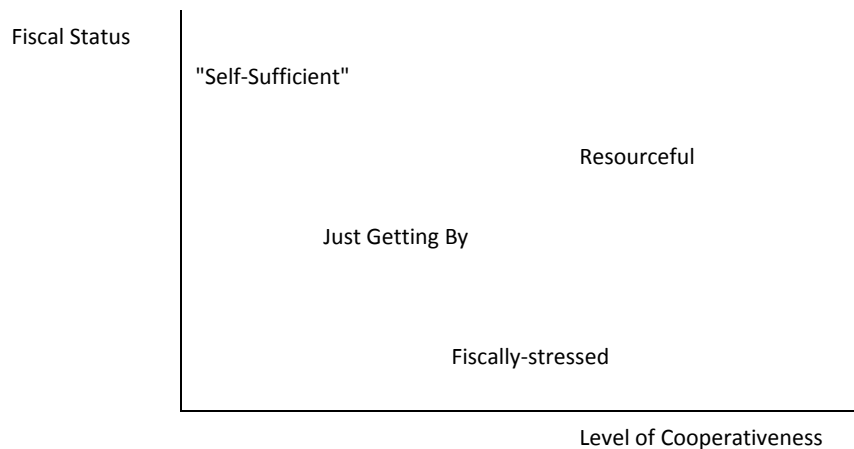
Region 13 and county personnel attend chiefs’ meetings and send out communications (letters and emails) with new equipment announcements. “The EMS County manager keeps us up to date about any new county or regional purchases. That’s how we know that it exists,” Respondent 40, an EMS director offered. “He sends out e-mails. A lot of e-mail notifications.” While resources lists are also posted on the county’s decision support software system, Knowledge Center, many municipal respondents either did not know the software was available to them or simply do not use it. Regional chiefs’ associations create resource lists available to mutual aid partners. These lists are distributed in hardcopy, but they are increasingly sent out via email and are occasionally posted online.

### **7.2.3 Financial Resources**

Resource dependence theory argues that agencies with limited resources will pursue strategies to gain assets needed for survival (Pfeffer and Salancik 1978). In circumstances where organizations experience fiscal stress or anticipate stress, cooperative arrangements offer

strategies to ensure organizational survival and maintenance (Cigler 1999). The role of financial resources may not be binary, however. LeRoux (2006) and Morgan and Hirlinger (1991) find that, in terms of inter-municipal cooperation, both very low income and very high income areas are more likely to engage in cooperation than organizations operating in the middle ground. Analysis in the present study reaffirms LeRoux (2006) and Morgan and Hirlinger’s (1991) findings and offers a possible explanation whereas fiscally stressed agencies reach out to well-off agencies for possible assistance.

The present study presents a typology of agencies to explain the role that fiscal stress appears to play on cooperation. While the relationship between fiscal status and cooperation is influenced by other factors, analysis of the semi-structured interview transcripts identified agencies that appear to be in four categories of fiscal status that influence interorganizational cooperation: self-sufficient, resourceful, just getting by, and fiscally-stressed. Figure 20 indicates the non-linear effect that fiscal status has on cooperation. Resourceful and fiscally-stressed agencies appear to be more willing to cooperate, while agencies that are “just getting by” or consider themselves to be “self-sufficient” appear to be less willing. The sections below explain.



**Figure 20: Relationship between Fiscal Status and Interorganizational Cooperation**

### 7.2.3.1 Fiscally-Stressed

“That \$3 or \$4 fish sandwich, it takes a whole lot more fish sandwiches to buy what it did 20 years ago” (Respondent 50).

Analysis of the semi-structured interviews indicates that agencies that experience severe fiscal stress often depend on neighbors for mutual aid and other resources to supplement low levels of staffing and their low operating budgets. Respondents recognize a threshold point where agencies are forced to work together to ensure their survival. Agencies in severe stress either identify opportunities to share or they may find themselves unable to meet basic operational minimums. Cooperative activities include cost saving strategies, mergers, and the sharing of resources. Manpower is a critical indicator of operational capacity and fiscal stress. If an agency does not have the resources to secure manpower, they cannot operate.

Before an agency becomes fiscally stressed to the point of bankruptcy, the present study finds that personnel including “working chiefs” dedicate their time and efforts to maintaining the agency, i.e. fighting for organizational survival. At this point the fiscal stress inhibits agencies from working together as limited manpower and time prevent dedicated cooperative efforts. Agencies “just getting by” may engage in mutual aid, but other types of collective action—mitigation, preparedness, and administration—may be neglected due to time constraints.



### 7.2.3.2 Just Getting By

“All of our chiefs are working chiefs” (Respondent 49).

Within the threshold points of low and high-levels of resources are agencies that are “just getting by.” While many managers who fall within this category acknowledge the benefits of cooperation, they are constrained by their obligations to maintain internal operations. There is a certain point that agencies reach where they are still independent and can operate without relying on other agencies for resources. These organizations usually are run by “working chiefs,” managers who are out in the field responding to calls as opposed to in-office administrators. Several police chiefs and EMS directors indicated that because of cutbacks they are forced to go in the field and respond to emergency calls, which inhibits them from participating in the regional planning and governance activities.

The focus on day-to-day response activities restricts a manager’s ability to develop cooperative projects. So while there is a threshold point where fiscal stress is so severe that agencies must develop cooperative arrangements in order to stay viable, there is a more populated area where agencies “just get by,” dedicating their resources to operations but not significantly pursuing cooperative activities.

Agencies are constrained by the lack of time and the unavailability of personnel to participate in interorganizational cooperation other than mutual aid. “A big obstacle is just being able to get out of the office to get to the COG meeting because it takes time. If you’re a one man show... If we’re busy, none of this gets done. I’m sure a lot of the other smaller agencies work like that” (Respondent 28). Respondent 35 described the obstacles that EMS directors face in

participating in cooperative efforts. “One thing that has hurt the organization is that most agencies are small and many of the directors have had to spend time on the ambulances because of staffing issues. And they can’t leave. [Regional planning] meetings have been poorly attended at best” (Respondent 35).

### **7.2.3.3 Resourceful**

“Affluence breathes the ability to think a little bit differently” (Respondent 51).

Agencies with more resources, i.e. staff, equipment, and money for overtime, not only appear more likely to recognize the importance of cooperation; they also simply have more manpower to dedicate to cooperation. “The larger the agency... what’s the phrase outlook for... the economy of scale, you are able to spare personnel to work on emergency management plans, to attend meetings with fire and EMS” (Respondent 21). These “resourceful” agencies pay competitive salaries and generally hire more experienced emergency managers. However, these municipalities are generally not so large that they can adequately handle large-scale incidents without mutual aid. Mutual aid then becomes an insurance policy to ensure service continuity during large-scale events. These emergency managers extend resources and personnel to less resourced agencies in return for future aid as need arises.

### **7.2.3.4 “Self-Sufficient”**

Interestingly, municipalities with the most resources indicate less of a willingness to cooperate. Their self-sufficiency breeds a “lone-ranger” attitude. This category includes large-municipalities with significant resources that typically boost the personnel to respond to most

incidents with no outside assistance. “Someone from a big town might think they don’t need assistance from a small town. They think they have everything that they need and that they don’t need any type of assistance,” Respondent 45 commented.

Self-sufficient agencies do not fear being taken over by other agencies, but they do fear the internal ramifications of regular cooperation. Within municipal governments, agencies use incident data to justify appropriation requests, personnel levels, and equipment purchases. Regular mutual aid may indicate less of a need for appropriations and justify elected officials to decrease funding. “If we were to have formal mutual aid agreements with all of the volunteer fire departments around the city, the case could be made that we could do away with the... fire houses that are close to the border” (Respondent 2).

#### **7.2.4 Time**

“Time is a volunteer firefighter’s worst enemy” (Respondent 12).

Analysis of semi-structured interviews indicate that lack of time acts as an obstacle, not necessarily to mutual aid, but to cooperation on other joint activities like planning, training, and prevention. “For the most part, when the whistle blows those guys all want to go out and put out the fire” (Respondent 28). However, fewer agencies and personnel participate in other activities. Agencies face time constraints exacerbated by administrative duties, commitment to family, and in the case of paid departments, money for overtime.

The leaders of these organizations increasingly are saddled with administrative responsibilities. “Most people don’t realize when you move up the ranks and your helmet gets lighter, the issue comes that you have more responsibilities that you didn’t realize were there”

Respondent 1 indicated. “Running fire calls is easy. That’s the easiest part of the job. Dealing with personalities, objects, paperwork and then throw on top of that... fundraising...”

Volunteer fire chiefs, with their jobs and family lives, have limited amounts of time to dedicate to promoting interorganizational cooperation outside of mutual aid. “I don’t get out to the meetings that some of these other chiefs do. My time is very restricted. I’m constantly just in meetings in the borough. I have a wife and two kids. Multiple stations. So that’s enough” (Respondent 3). Respondent 8 elaborated on the strain that the long hours put on a relationship. “It’s been a huge sacrifice over the years. I don’t think people really appreciate what kind of sacrifice it is. I’ve missed out on a lot of family events. It’s a miracle that I am still married because I’ve pissed my wife off so many times” (Respondent 36).

The time of EMS and police personnel costs money. And as mentioned above agencies operate with a limited amount of resources. “I don’t have time on the schedule to send a guy away. If I send a guy away I have to pay overtime to back fill the slot; a lot of it is dollars and cents” (Respondent 28). Some EMS agencies focus on revenue generation at the expense of emergency management. “Any EMS now is so business-oriented that we have taken the approach that we need to do transports in addition to emergency services” (Respondent 40).

Police and EMS run on average more calls than fire departments. The operational imperative of constant emergency calls limits the time available to pursue cooperative activities outside of mutual aid. Respondent 21, a police chief, spoke to the idea that fire personnel generally have more time to devote to emergency planning:

I joke with our fire chief, we are in the police discipline. It’s not like we have time to sit around and write plans all day. We work 24 hours, 7 days a week answering calls, while you are playing around in the garage. We have this good-natured relationship. Having said that, I think there is some truth to that. I can’t speak to EMS, but fire does have some downtime. They have a much lower number of calls. They have the time to spend on emergency management and on the training. On the development of policy, the

development of manuals, the development of plans. Police work does get in the way of that. We are usually pressed to meet the actual workload out there.

### 7.3 SYSTEMIC COMPETITION

“The for-profit agencies are out to make a buck... I pretty much view them as a competitor...”

(Respondent 35)

Several forms of systemic competition inhibit collective action. Competition cultivates rivalries and grudges that ingrain in organizational culture and impede cooperation. Competition for power and authority on a response scene, competition between EMS agencies for revenue, and competition between fire departments for “prestige” limit interorganizational cooperation.

Respondent 22 spoke of the competition for power and authority on scene. “There’s a little bit of competition between EMS, the fire service, and law enforcement when you get to a critical incident...” Generally, respondents indicated that their agencies adhere to a unified command structure that enables coordination through a divided command structure. Many first responders interviewed make a determination on scene regarding the type of incident and install the relevant service chief as the primary incident commander. However, there are some instances where competition for power and authority limit coordination.

EMS agencies increasingly find themselves competing for revenue. In Allegheny County, municipalities choose their emergency transport providers and County 9-1-1 reaffirms these decisions by only dispatching the primary provider. “On the emergency side, there is not as much of an issue because the 9-1-1 center does a very good job of dispatching the home service to a call in its area.” However, there is not the same level of supervision regarding non-

emergency activities. This competition for non-emergency patient transports creates tension between agencies (private, nonprofit, and public) competing for business.

On the non-emergency side, there are two things that we see. One there are private EMS services... some of the agencies that are in the business of non-emergency transports, they will come in and cherry pick these transport calls out of somebody else's home territory. That creates a tremendous amount of unhappiness. The other thing on the non-emergency side is when patients are being discharged from a hospital coming back to a home district that home service very often wants the chance to go get them. They don't want somebody else bringing one of their residents back to their home service area (Respondent 38).

Competition, or at least suspicion, clearly exists between for-profit and not-for-profit agencies. Respondent 35 explains the dynamic. "The for-profit agencies are out to make a buck. I think they are purely driven by the bottom line. I pretty much view them as a competitor... They wouldn't be someone who I would pick up the phone and call to ask if they've seen this or that issue. They have a different mindset. Their decisions process is a lot different than ours."

There is a certain degree of competition among nonprofit and public EMS agencies also. "I think that the services that do non-emergency transport are less likely to work with their neighbors. Because I know there are services out there who have occasionally tried to steal business off of each other. I think they have harbored some bad blood" (Respondent 35).

The fire discipline is an apparatus and equipment-intensive service. Analysis of semi-structured interviews clearly identifies the pride that personnel take in their equipment and competition for prestige that exists. "Departments try to stay ahead of the curve for bragging rights. Sometimes it hurts relationships too. For that department that maybe doesn't have all the resources available, sometimes they take offense at that bragging" (Respondent 8). This competition may also lead to personality conflicts and inhibit collective action.

## 7.4 GEOGRAPHY AND DISCIPLINE

Geographic location and discipline (fire, police, and EMS) positively correlate with the extent to which agencies cooperate. Univariate ANOVA was used to determine mean differences between the numbers of partners (degree centrality) based on discipline (fire, police, and EMS) and geography (council of government regions). Findings indicate that cooperation correlates with specific disciplines and geographic regions, showing that police cooperate more than other disciplines (an average of 7.949 more agencies than EMS and 3.784 more than fire) and that the northern suburban regions (of the field study area) are more likely to cooperate than other geographic areas. EMS agencies interact with more agencies on average (4.165) than fire, confirming the analysis of Chapter 6.<sup>29</sup> Table 41 reveals these mean differences by discipline.

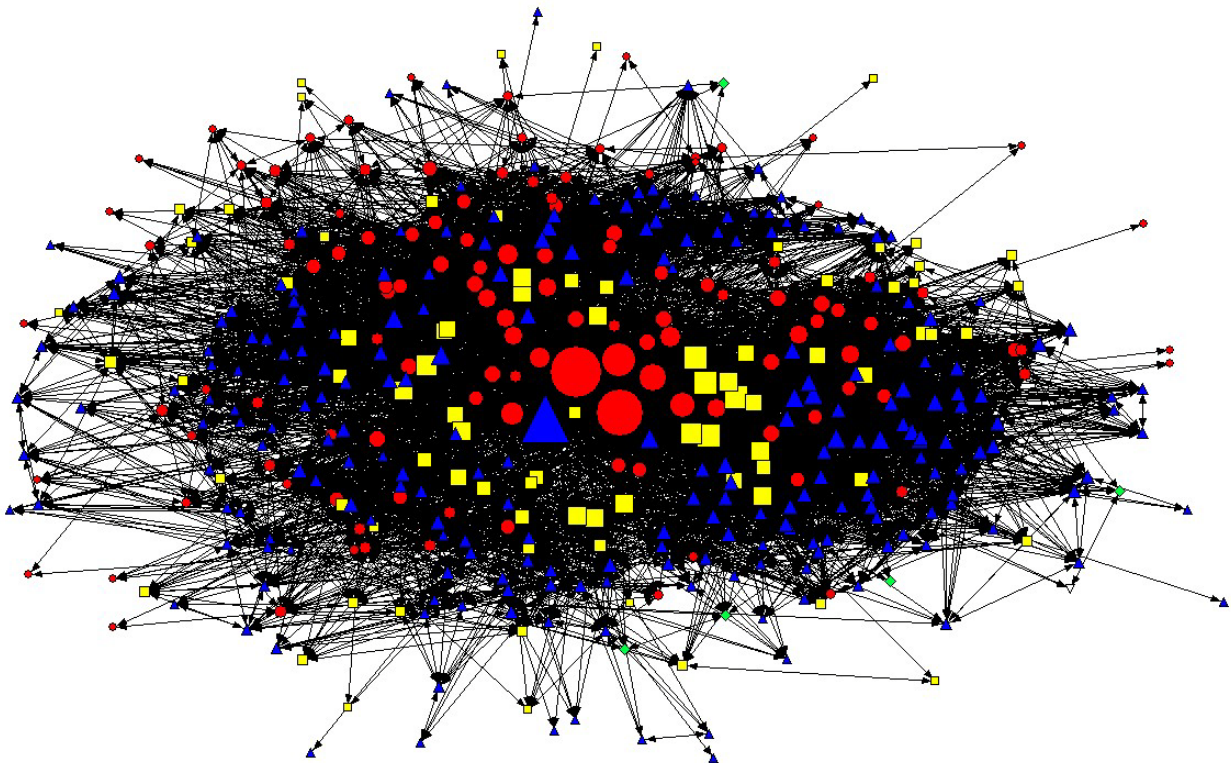
**Table 41: Mean Differences in Degree Centrality by Discipline (Municipal Agencies Only)**

(I) Discipline#	(J) Discipline#	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Fire	Police	-3.784*	1.255	.008	-6.74	-.83
	EMS	4.165*	1.325	.005	1.05	7.28
Police	Fire	3.784*	1.255	.008	.83	6.74
	EMS	7.949*	1.557	.000	4.29	11.61
EMS	Fire	-4.165*	1.325	.005	-7.28	-1.05
	Police	-7.949*	1.557	.000	-11.61	-4.29

\*. The mean difference is significant at the 0.05 level.

<sup>29</sup> Using the results of the interagency cooperation index survey, a second analysis (while not producing statistically significance) supports the hypothesis that police are more likely to cooperate than other agencies.

The prominence of police agencies (municipal, county, and state) is visually depicted in Figure 21. Police nodes (red circles), sized by degree centrality, are centrally located in the network's core surrounded by EMS agencies and fire departments on the periphery. Figure 21 visually supports the analysis of network data in Chapter 6, which statistically shows the prominence of police agencies in the network. Allegheny County Police, including their detective unit (Degree 282, Nrm Degree 63.5) and their photo lab (Degree 165, Nrm Degree 37.2), the Shaler Township Police (Degree 125, Nrm Degree 28.2), and Northern Regional Police (Degree 120, Nrm Degree 27.0) sit at the center of the network. They have four of the top six system degree centrality scores. Fire departments are more likely to have fewer partners as they generally focus on a limited geographic area.



**Figure 21: Diagram of Interacting Agencies by Discipline, Allegheny County, Pennsylvania**

**Square (yellow) = EMS; Up triangle (blue) = Fire; Circle (red) = Police;  
Down triangle (white) = Emergency Management**



Certain geographic areas demonstrate a higher rate of cooperation than others. Agencies in Allegheny North Valley and the North Hills COGs, on average, cooperate with more agencies than agencies within several other COG areas. Those two COG areas possess more agencies than others. Coupled with the propensity of agencies in close proximity to cooperate, findings may lend credence to previous studies that indicate that increased density of agencies within a geographic area increases the likelihood of cooperation (LeRoux 2006; Feiock 2007).

## **7.5 GEOGRAPHIC AND CONCEPTUAL PROXIMITY**

“It’s hard to explain taking someone off the run card for somebody farther away...” (Respondent 10)

Analysis of the social network data reaffirms complex adaptive systems (CAS) research that indicates that the proximity of actors both in terms of physical space (geography) and conceptual space (discipline) increases the likelihood of interaction (Axelrod and Cohen 1999). Actors exhibit the tendency to interact with others who share similar characteristics (Holland 1995), a phenomenon known as homophily (Merton and Lazarsfeld 1954). Spatial and conceptual proximity (or homophily) increase the likelihood for interaction and the opportunities for feedback. The present study identifies homophily based on geographic location as an indicator and to a lesser extent discipline (or conceptual proximity). A visual analysis of the fire, police, and EMS network maps as well as findings from a clique analysis reaffirm these conclusions.

### 7.5.1 Geographic Proximity

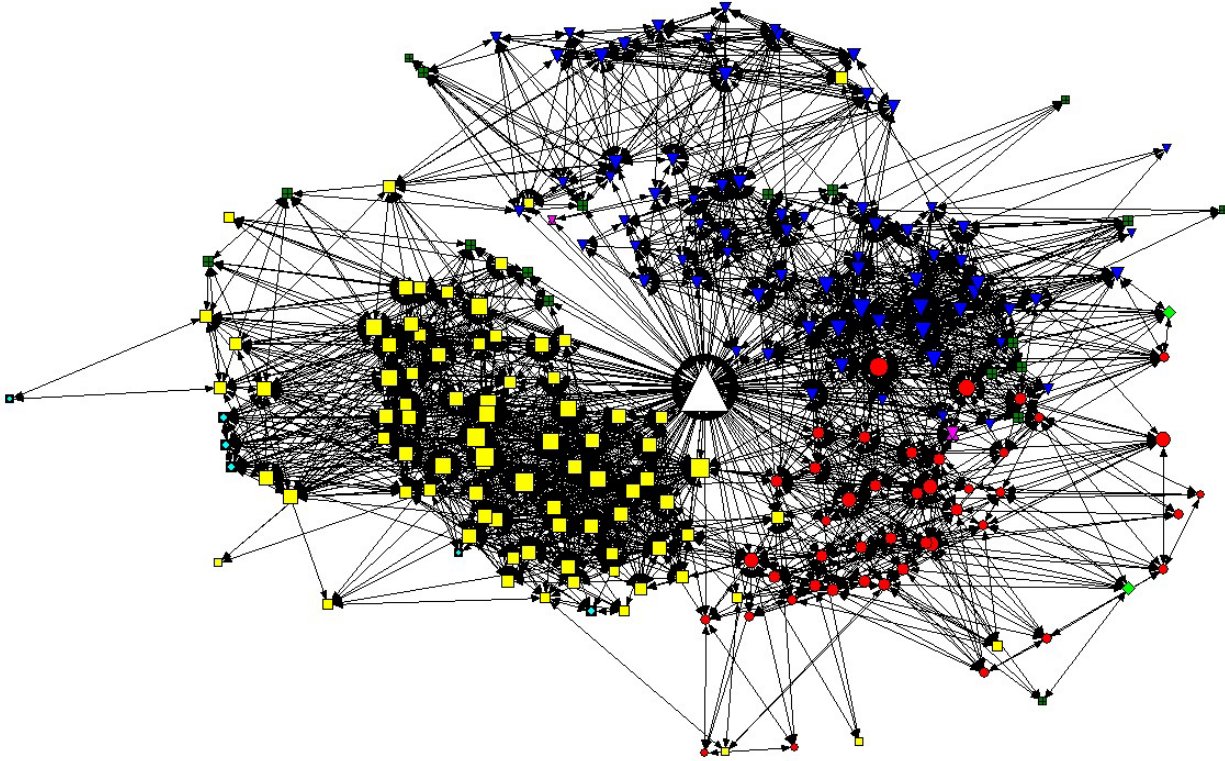
To what extent do agencies interact with one another on the basis of geographic location? Analysis of the semi-structured interviews and spatial analysis of the 9-1-1 call data reveal the prominent role of geography. Close proximity increases the likelihood of cooperation, particularly during response operations. Most agencies interact in dense patterns with their immediate geographic neighbors and other close agencies. This trend reaffirms the neighborhood-centered network model described in Chapter 6.

Homophily analysis demonstrates the positive influence of geography as a forecaster of cooperation during response activities. Table 42 presents the total number of relationships (11,564) between municipal-level agencies in the field study area and demonstrates these agencies work with others within their geographic region (dispatch zone) more often than agencies from other locations. For example, agencies in the North dispatch zone interact with others from the same zone at a rate of 89.38 percent. The same trend holds in the east (82.44 percent) and south (73.36 percent) dispatch zones. The central dispatch zone is comprised of agencies from just two municipalities: the City of Pittsburgh and the Mt. Oliver Borough.

**Table 42: Homophily by Location, Dispatch Zone (Complete Network)**

	South		North		East		Central		Total	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
South	1834	73.36	302	5.52	337	9.53	27	50	2500	21.62
North	302	12.08	4892	89.38	268	7.58	11	20.37	5473	47.33
East	337	13.48	268	4.9	2916	82.44	16	29.63	3537	30.59
Central	27	1.08	11	0.2	16	0.45	0	0	54	0.47
Total	2500	21.62	5473	47.33	3537	30.59	54	0.47	11564	100

Figures 22, 23, and 24 (below) visually confirm the positive role that homophily (or collocation in the same geographic region) plays in influencing cooperation, which validates previous research on inter-municipal cooperation (Morgan and Hirlinger 1991; Krueger and McGuire 2005). Figures 22, 23, and 24 reveal how collocation in the same area (9-1-1 dispatch zone) increases cooperation during response. Clearly, the colors and shapes (symbolizing location) cluster together, which demonstrate that agencies are more likely to interact with others from within their dispatch zone. Respondent 29, a police chief, explains the phenomenon. “Depending on the size of the incident, a department will call the closest departments and then start calling out...” Figures 28, 29, and 30 visually demonstrate the resulting patterns of interaction influenced by close geographic location.



**Figure 22: Diagram of Interacting Fire Departments by Dispatch Zones**

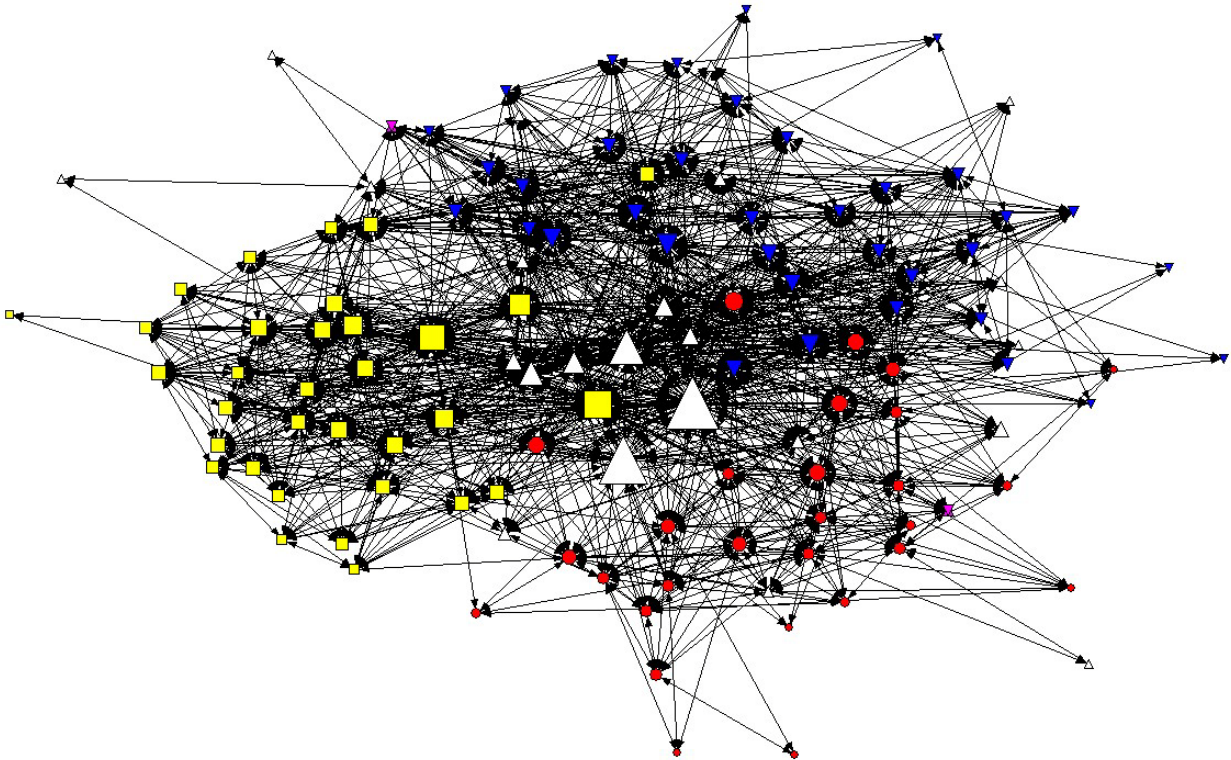
**Nodes sized by degree centrality statistics.  
Isolates and pendants removed.**

**Square (yellow) = North; Circle (red) = South; Down Triangle (blue) = East;  
Triangle (white) = County Agency**

**\*The central dispatch zone (Pittsburgh and Mt. Oliver) play a peripheral role in this network.**

Figure 22 visually depicts the patterns of interaction among fire departments, distinguishing the departments based on their dispatch zone. The large white triangle in the center of the network represents the county fire marshal's office. Chapter 6 identifies this agency as the center of the network. Surrounding the fire marshal's office are three distinct clusters of agencies based on geographic location: the north dispatch zone (represented by squares), the south dispatch zone (represented by circles), and the east dispatch zone (represented

by down triangles). These patterns of interaction visually confirm the homophily statistics in Table 42.



**Figure 23: Diagram of Interacting Police Departments by Dispatch Zones**

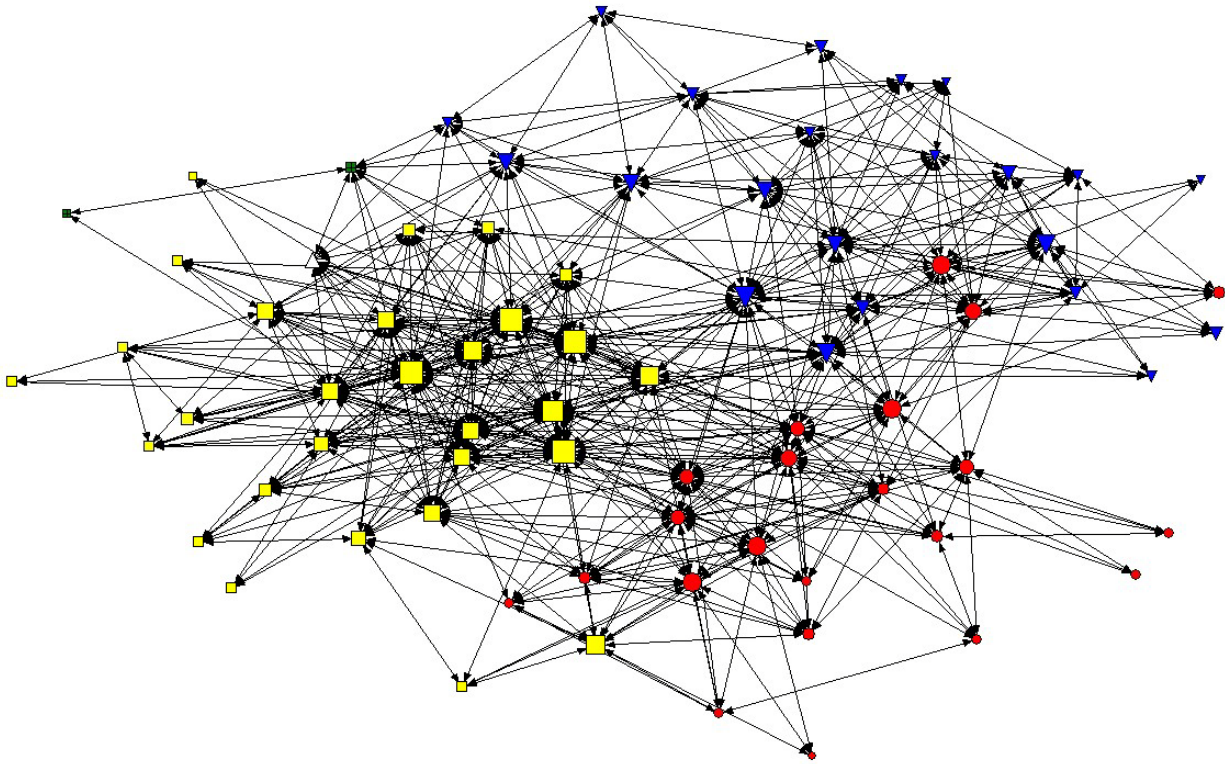
**Nodes sized by degree centrality statistics.  
Isolates and pendants removed.**

**Square (yellow) = North; Circle (red) = South; Down Triangle (blue) = East;  
Triangle (white) = County Agency**

**\*The central dispatch zone (Pittsburgh and Mt. Oliver) play a peripheral role in this network.**

Similar to the fire network, Figure 23 (police) and Figure 24 (EMS) visually demonstrate the clustering of agencies based on geographic location. The white triangles in Figure 23 represent core, county-level agencies such as county police divisions and the county sheriff's office. The EMS network (Figure 24) lacks a central county influence during response operations, but nevertheless demonstrates the same pattern of interaction seen in the police

(Figure 23) and fire (Figure 22) networks. Even though EMS agencies generally cover larger geographic areas across multiple jurisdictions, they still demonstrate the propensity to work with others in their same geographic area.



**Figure 24: Diagram of Interacting EMS Agencies by Dispatch Zones**

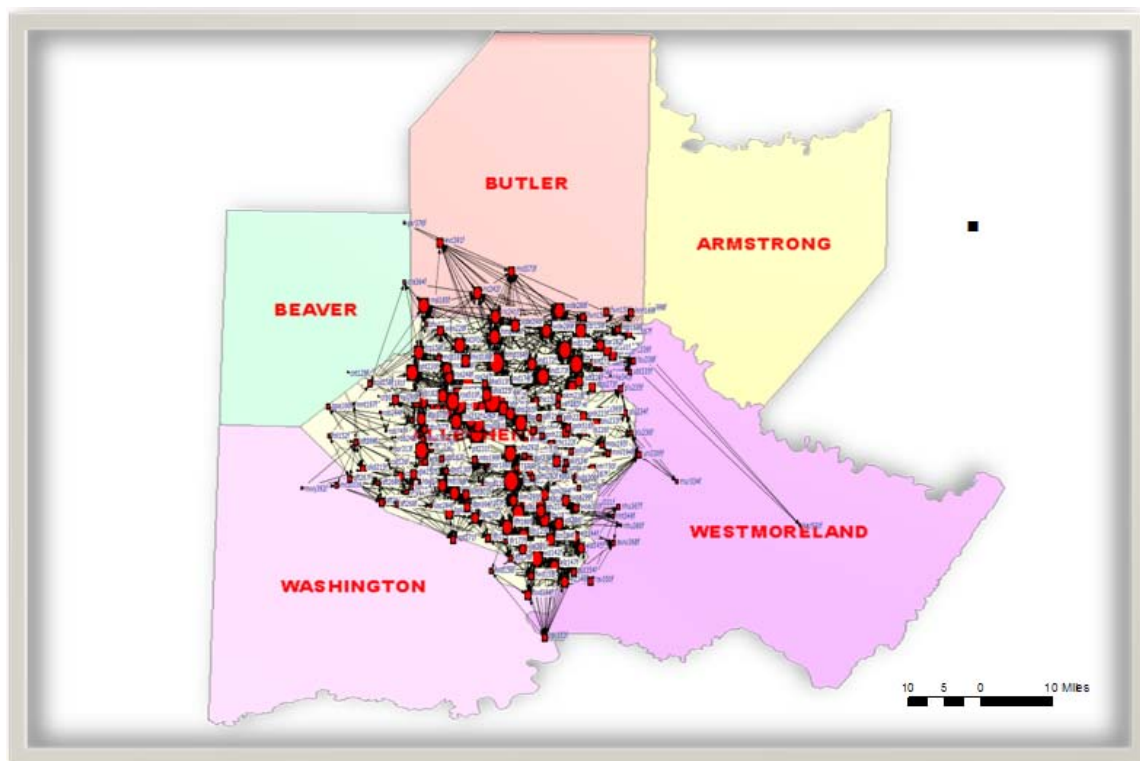
**Nodes sized by degree centrality statistics.  
Isolates and pendants removed.**

**Square (yellow) = North; Circle (red) = South; Down Triangle (blue) = East;  
Triangle (white) = County Agency**

**\*The central dispatch zone (Pittsburgh and Mt. Oliver) play a peripheral role in this network.**

Another strategy used to demonstrate the role of geographic proximity is visually depicting the patterns of interaction on a fixed map. Figures 25, 26, and 27 identify the geographic positions of fire, police, and EMS agencies and illustrate the patterns of interaction

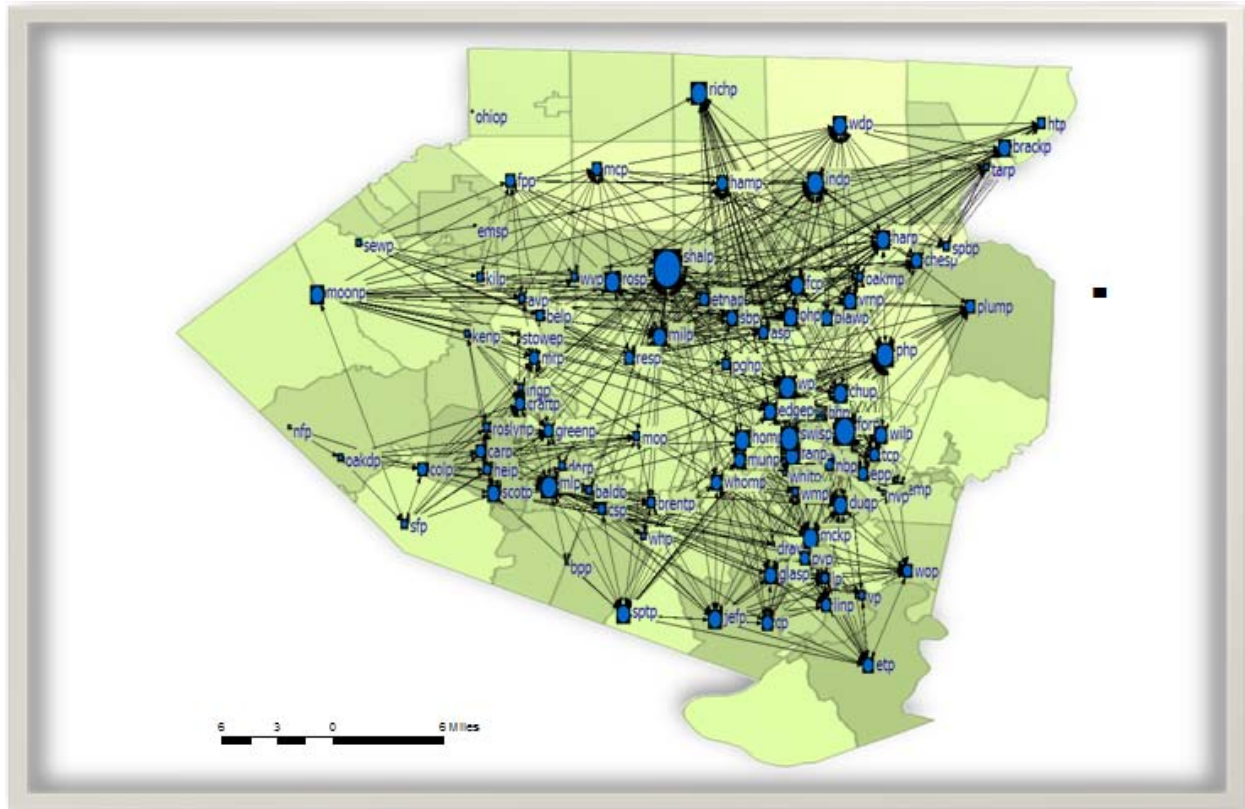
that exist within the network.<sup>30</sup> A closer inspection reveals that most agencies are connected to their immediate neighbors (as opposed to random connections throughout the networks). These findings support the homophily analysis above as well as past research on the positive role of adjacency in promoting cooperation between municipal governments (LeRoux 2006; Carr, LeRoux, Feiock, and Shrestha 2007; Feiock 2007).



**Figure 25: Diagram of Interacting Fire Depts. by Location, Allegheny and Surrounding Counties  
Nodes Sized by Degree Centrality**

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<sup>30</sup> Figures 24-26 were created using UCINET and ESRI's ArcGIS 9.3 by Dr. Leonard Huggins using the Allegheny County 9-1-1 emergency call records. The author extends his gratitude.

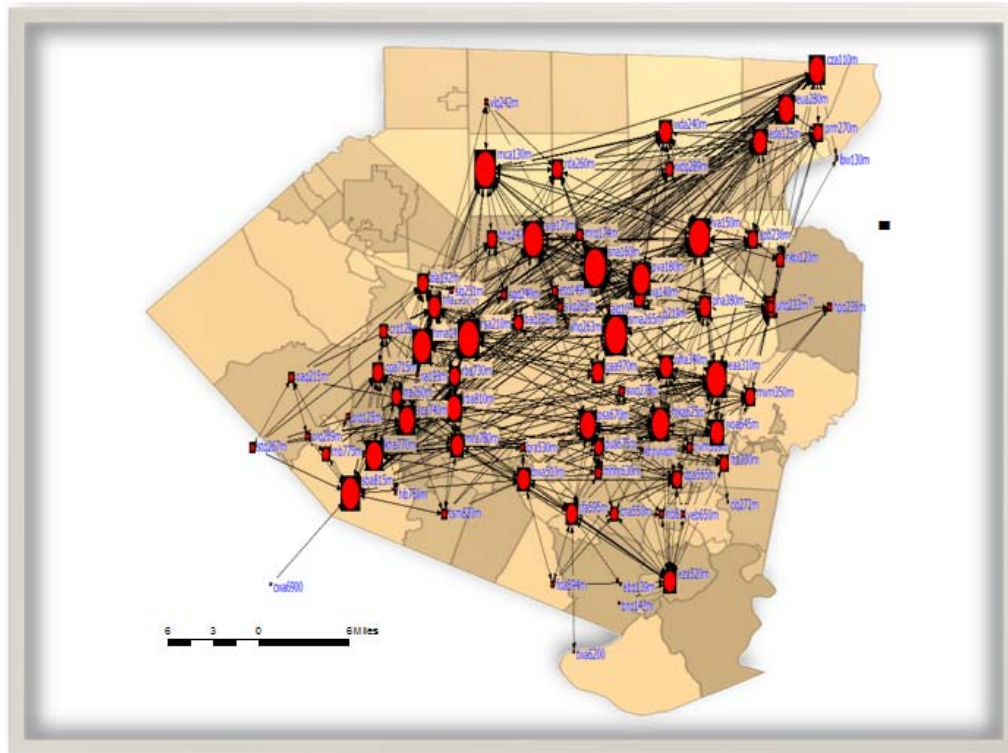


**Figure 26: Diagram of Interacting Police Depts. by Location, Allegheny County**  
**Nodes Sized by Degree Centrality**

Clique analysis of the fire, police, and EMS networks confirms the positive role played by geographic proximity. Scott (2005) defines a clique as “a sub-set of points in which every possible pair of points is directly connected by a line and the clique is not contained in any other clique” (p. 114). The minimum size for a clique is three. An inspection of the fire, police, and EMS clique configurations by discipline demonstrates the strong influence of geographic location. While there are boundary spanners such as the Shaler Police Department (shalp) that frequently interact across geographic clusters, the vast majority of cliques are based on geographic location. These findings reaffirm the small-world model found in the complete network (see Chapter 6). Many of the fire network’s cliques are neighborhood-based clusters.



For example, the North Braddock, Forest Hills, Wilkins 2, United FD Swissvale 2, and Rankin (all neighbors) make up just one of the many cliques based on geographic position. Because of the nature of EMS agencies, i.e. their coverage of multiple-municipal jurisdictions, they are more likely to boundary span. However, even their cliques follow a geographic-based pattern.



**Figure 27: Diagram of Interacting EMS Agencies by Location, Allegheny County**  
**Nodes Sized by Degree Centrality**

### 7.5.2 Conceptual Proximity

To what extent do agencies interact with one another on the basis of discipline? Organizations that share ideas, missions, and goals are more likely to cooperate (Axelrod and Cohen 1999).

Findings indicate that fire and police departments demonstrate homophily, while EMS agencies are less likely to be responding with others of the same discipline. Table 43 reveals the degree of homophily based on the total number of partnerships (15,236). Of fire’s 7,052 interactions 4,498 (63.78 percent) are with other fire departments. To a lesser percentage, police work with other police (55.50 percent). The plurality of EMS relationships, however, exist between fire departments (36.85) as opposed to other EMS (35.82 percent) and police (27.33 percent). These findings reaffirm EMS agencies’ role as boundary spanners that are more likely to serve several municipalities, working more with municipal-based police and fire rather than other EMS agencies. These patterns of interaction may also be explained by the routine incidents dealt with on a day-to-day basis. EMS cooperation with other EMS is generally limited to larger-scale, less regular incidents such as mass casualties. EMS agencies are more likely to work with fire and police on a regular basis due to the regularity of their incidents and the sparser geographic distribution of EMS agencies.

**Table 43: Homophily by Discipline (Complete Network)**

	Police		Fire		EMS		Total	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Police	2816	55.50	1408	19.97	850	27.33	5074	33.30
Fire	1408	27.75	4498	63.78	1146	36.85	7052	46.29
EMS	850	16.75	1146	16.25	1114	35.82	3110	20.41
Total	5074	33.30	7052	46.29	3110	20.41	15236	100

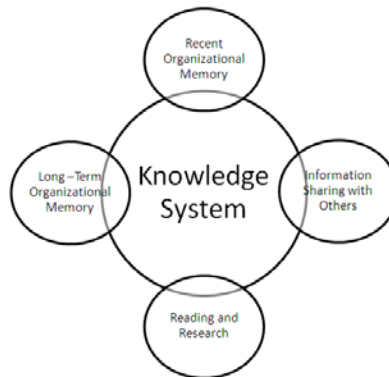
## 7.6 INFORMATION INFRASTRUCTURE

“When we are working an operation, we have to be able to talk to one another” (Respondent 27).

The formal information infrastructure in the field study area is made up of technical systems (i.e. radios, cell phones, mobile data terminals (MDTs), etc.) as well as the rules and regulations governing who has access to information, when, and in what contexts. The infrastructure constrains the availability of information and shapes the decisions of agency leaders. Organizations depend on technical systems for communication and information processing (Hutchins 1995; Simon 1996; Fountain 2001). Timely, accurate information facilitates decision making in emergency management (Comfort 1999). The extent to which agencies access and disseminate relevant information influences whether they recognize opportunities to cooperate and develop effective strategies for collective action. The information infrastructure in the field study area positively influences cooperation during most response incidents as agencies receive and exchange timely, accurate information related to their operations. However, limitations in technology and organizational design inhibit cooperation in certain circumstances, such as large-scale incidents and many non-response activities.

Knowledge systems, which facilitate collective cognition (and collective action), obtain information from several sources. Analysis of semi-structured interviews reaffirms Graber (2003) and Comfort (1999) regarding organizational information-gathering strategies. Figure 28 visually demonstrates the sources of information that generate knowledge systems. Agencies in Allegheny County rely on both their short and long-term organizational memory, information search and exchange tactics, and to a lesser extent reading and research to acquire information

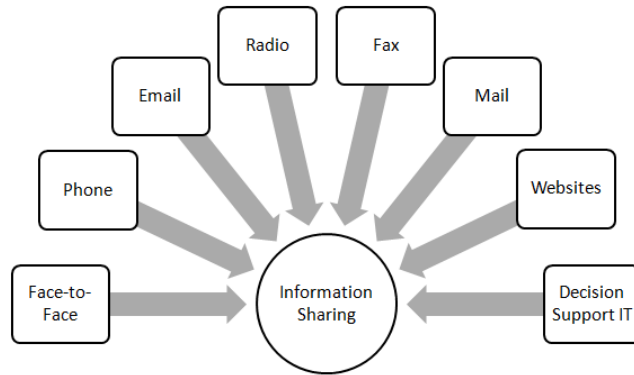
relevant to decision making. For example, the role of scientists, engineers, and journalists is apparent leading up to a major storm. First responders monitor television news, online weather reports, online stream-level information, and even interact directly with the National Weather Service's local office in an effort to assess risk and develop appropriate strategies for action.



**Figure 28: Sources of Knowledge Systems**

**SOURCE: Adapted from Doris Graber, *The Power of Communication: Managing Information in Public Organizations* (CQ Press: Washington, D.C.), 32.**

Figure 29 presents the various means through which agencies acquire and share information with other agencies. An array of face-to-face, phone, email, radio, and faxing tactics are used to communicate before, during, and after cooperation. Mailing information is used in non-urgent, administrative settings. Increasingly, agency personnel refer to other agency websites for information, particularly about available equipment. To a much lesser extent, decision support information technology is employed to search for and exchange information.



**Figure 29: Means through which Agencies Search for and Exchange Information with Each Other**

The sections that follow argue that some elements of organizational design, i.e. stand-alone municipal dispatch centers and the assignment of radio frequencies to municipal-level departments, limit situational awareness and may impede cooperation. It also suggests that online sources and other information technologies contribute to whether agencies receive and recognize relevant data regarding their vulnerability to risk.

### **7.6.1 Organizational Design**

When decision makers do not have access to information or if information is no longer valid then decision making suffers. While the field study’s information infrastructure is bolstered by a number of technical systems, information asymmetry is perpetuated by certain elements of organizational design. Although county-level agencies develop and maintain robust information systems, municipal level systems appear to be relatively weaker. Stand-alone municipal dispatch centers and the assignment of radio frequencies to agencies in limited geographic areas (at times) impede cooperation during response. First responders operating on different radio frequencies or dispatched by different call centers may develop uneven situational awareness in the face of

rapidly, evolving dynamic events. What appears to be urgent to one decision maker may not be recognized by another based on the uneven distribution of available information. Without a common operating picture, agencies fail to recognize the need for collective action.

A central dispatch center acts as a repository of available information. The field study area's county 9-1-1 dispatch center facilitates communication throughout those municipalities who participate in the system. Some municipalities maintain independent dispatch centers with the rationale that "the dispatchers know their own streets. They know the areas. They know the individuals calling sometimes. When somebody calls and indicates an incident in a specific area that is not labeled or marked, our dispatcher will know where it is" (Respondent 3). During multi-municipal incidents independent dispatch centers can impede communication. A police chief, Respondent 28, indicated the potential for delay and failure when working through multiple actors to communicate with mutual aid partners. "If [our neighbor who self-dispatches] has a robbery, I'm not going to know. They will call [their municipal] dispatch, who will call the county [dispatch], who will give it to me on the radio. That might be five minutes before the information comes up. There are all of these links that have to take place. It causes delay" (Respondent 28).

Critical pieces of information about potential incidents such as a gunman, a hazardous material spill, or a mass casualty shape life and death decisions made by emergency managers. The omission of this information, which increases in likelihood with the number actors relaying information, exposes first responders to unnecessary risks and limits the extent to which backup or mutual aid is requested.

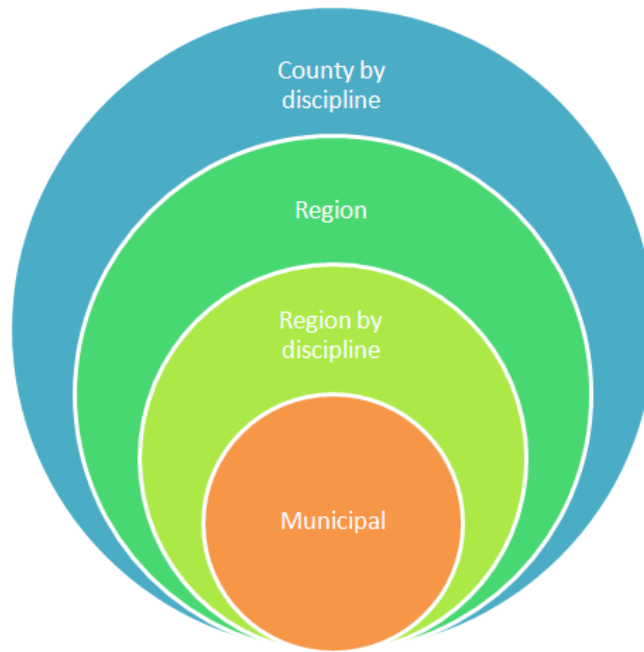
The field study's central dispatch system maintains "run cards," or preplanned mutual aid preferences, that provide guidance to dispatchers regarding what agencies to send for automatic

mutual aid. Independent dispatch centers do not maintain this information for all mutual aid agencies. Agencies have the technical ability to bypass fragmented dispatch centers, if needed. “I can take my portable radio and just change channels to [agencies that are self-dispatched] and talk directly to them” (Respondent 28). To achieve this communication, the first responder must know with whom they want to talk and when.

Agencies operating on the same frequency monitor each other’s activities and develop situational awareness of each other’s needs and capabilities. “Being on the same channel is like talking face-to-face. I can hear what’s going on in your community” (Respondent 18). Monitoring radio communications across municipal borders increases situational awareness. Radio frequencies, however, are assigned by county emergency services. Several communities operate on frequencies other than their neighbors. “It’s harder to communicate with other municipalities if they are on different frequencies” (Respondent 3). This division of municipal agencies per their radio frequency assignment inhibits collective action. Figure 30 visually depicts the different scales of radio levels of radio assignments available to certain agencies in the field study area. Many agencies are limited to their particular scale and unable to communicate with other levels. Some municipal police departments, for example, exclude fire departments from being able to communicate on their frequencies, which creates information asymmetry.

Increasingly, first responders and other emergency managers in the field study area have the option and technical capacity to monitor multiple radio frequencies. While the rules governing interoperability limit communication to some extent, available technology is increasing organizations’ ability to communicate. Federal and state grants following the terrorist attacks of 9/11 increased the technical interoperability of the field study’s radio equipment.

Respondent 22, a police chief, explained the scalable levels of radio communication available to police (and other first responders). “We have our own frequency... We can switch over to all of our neighboring police departments frequencies. And there is a central County frequency... ‘the pursuit frequency.’ Everybody can switch over to this frequency and communicate.”



**Figure 30: Scale of Available Radio Frequencies to County and Municipal Agencies**

### **7.6.2 The Role of Information Technology in Promoting Cooperation**

Departments use information technology in several ways to facilitate cooperation and coordination, including activities centered on resource management, intelligence gathering, and risk assessment.

The use of online resource lists supports joint resource management and educates first responders per available equipment and services within the field study area. Semi-structured interviews reveal an increasing use of websites (and to a lesser extent decision support software)



to communicate available resources in order to promote cooperation during response, preplanning, and training. Regarding decision supports software, use is limited predominantly to county and a large city. Despite access to a county-purchased online system, most departments are unaware of its availability. The majority of agencies who manage their resources collectively depend on email lists or websites.

Police departments use email to share intelligence. Respondent 20, a police chief, described the arrangement. “There’s a new thing out called SPIN. You join and share information and intelligence. If we have surveillance photos of a shoplifter we can post them and ask for them to be identified.” The coordinating effect that information technology affords to departments is considerable. “In a small department, sometimes intelligence can get lost. With SPIN, we can more easily find information. Things don’t fall through the cracks” (Respondent 20).

Finally, a small number of agencies use mobile data terminals to access shared risk assessments and situational awareness. Mobile data terminals (MDTs) and computers increasingly have access to the county’s real-time computer aided dispatch (CAD) information. Respondent 14, a fire chief, described shared data sources, including GIS and other information. “All they have to do is punch in the address and it brings up a GIS map of how to get to it. And it gives you pictures [of the location].” Respondent 8, a fire chief, said “we’re using preplan software with laptops and all of the vehicles. We are using a software system called First Look Pro. It’s preplanning software. Basically you enter in an address and you get all the information that we’ve entered about that address.”

## 7.7 INFLUENTIAL ACTORS, RULES AND INCENTIVES

What formal control do actors at various levels of the system exert over other participants? What rules, laws, and procedures do agencies at various levels of government generate to govern the public safety/emergency management system? What policies specifically promote interorganizational cooperation? Analysis indicates that several influential (outside) actors incentivize or at least lessen barriers to collective action, reaffirming Ostrom's (2005) basic contention that the rules and policies created by external actors influence the decisions made by system participants.

Influential actors operate at all levels of government: federal, state, and local. Federal and (to a lesser extent) state grant programs incentivize cooperation, particularly joint purchasing. Also, as "creatures of the state," municipal agencies are governed by state statutes. A series of recent legislation (in addition to established statutes) enable emergency management and first response agencies to work together more freely without liability concerns. While uncommon, one statute (Title 35 of the Pennsylvania Codes) mandates cooperation, requiring municipalities to create and update municipal emergency operations plans (MEOPs) and submit them to county and state agencies. Recent state legislation that limits liability during mutual aid is seen as a major factor facilitating cooperation. Not all policies and actions promote collective action. While not common, some municipal leaders, skeptical of the benefits of sharing resources, balk at the prospect of giving resources away.

### **7.7.1 Federal Actors**

Federal actors influence the field study area willingness and ability to cooperate through several policies and programs. First, DHS and FEMA grants provide an incentive for action to some extent. Second, NIMS and NRF (federal policies) promote cooperation as a core competency of emergency management. Third, DHS funds the counterterrorism task force infrastructure, which facilitates trans-jurisdictional cooperation in the field study area through Region 13. Fourth, the Post-Katrina Reform Act may create a more operational FEMA, which may provide additional resources and encourage expanded coordination between federal, state, and local entities.

#### **7.7.1.1 Federal Grants**

Respondents recognize grant money as a strong incentive for action. “Although I do think that a lot of these folks are altruistic and they do things for the right reasons... I think that funding is their biggest motivator” (Respondent 55). This comment underlies the potential that grants serve in promoting interorganizational cooperation. First responders recognize the opportunities for funds based on the precondition of cooperation. “Grants are becoming more and more difficult to get. The government is pushing for more cooperation or mergers between departments. They are willing to reward departments for cooperation or mergers because they see our dwindling resources” (Respondent 13). While federal and state emphasis still focuses on grants programs that grant funds to individual departments, respondents recognize the increasing incentives for cooperation.

Local first responders identify FEMA’s Assistance to Firefighters Grants (AFG) as an incentive for collective action, particularly joint and coordinated purchasing. The program funds fire and EMS apparatus, equipment, and protective gear acquisition as well as some training

initiatives. FEMA also administers Staffing for Adequate Fire and Emergency Response Grants (SAFER) and Fire Prevention and Safety Grants (FP&S) to fund recruitment and incident prevention programs (Federal Emergency Management Association 2010). FEMA promotes cooperation by offering a “regional application” in which agencies propose joint purchases or co-ownership for the purpose of cost savings. A popular joint purchase has been “communication equipment such as portable and mobile radio” (Respondent 43). This underlies DHS and FEMA’s programmatic focus on promoting interoperability between communication systems, but again the bulk of grant funds is not dependent on cooperation, which allows first responders, by in large, to pursue funds independently.

#### **7.7.1.2 The National Incident Management System and the National Response Framework**

Two federal policies, the National Incident Management System (NIMS) and the National Response Framework (NRF), promote cooperation as a core competency of emergency management. DHS (and FEMA) request minimum NIMS education qualifications in order to qualify for certain grant programs. While NIMS training may not be a direct form of interorganizational cooperation, it does promote it by emphasizing the Incident Command System (ICS) and a common lexicon of emergency management terms aimed at improving interorganizational interoperability during response activities. Generally, NIMS promotes the idea of cooperation. Occasionally, NIMS courses are held in classroom settings that are jointly sponsored and attended by first responders, which may foster networking and relationship building.

With respect to interdisciplinary cooperation, fire departments tend to integrate well into larger incident response systems. One explanation is that the values of the Incident Command System (ICS) have been ingrained into fire’s culture and correspondingly into their operational

routines. Respondent 28, a police chief, compared fire's ability to cooperate with other disciplines. "They do the coordination thing better. They have a 'more the merrier' mentality." "They fold into [operations] very well regardless of where they are from," Respondent 39 added. Respondent 21 attributed this core competency to ICS. "Traditionally, fire has embraced the incident command structure. They integrated it into their discipline and their daily operations," (Respondent 21).

### **7.7.1.3 Counterterrorism, All-Hazards Task Forces**

DHS demonstrates another commitment to interorganizational cooperation by funding Pennsylvania's regional counterterrorism task forces. The administrative (and operational) entities increasingly emphasize an all-hazards approach to emergency management. Region 13, introduced in Chapter 4, is the field study area's regional task force. Through PEMA, DHS distributes \$48 million of federal funds annually throughout the commonwealth. "Part of the agreement to participate in a task force is that any resource has to be shared task force wide. And planning has to be done regionally as opposed to locally. That really promotes a regional approach" (Respondent 57). In the case of Region 13, respondents from the federal to the municipal level spoke of the task force's role in promoting cooperation across counties and municipalities, particularly, in the areas of resource management and preparedness.

### **7.7.1.4 Post-Katrina Reform Act of 2006**

Although not yet recognized in the field study area by first responders, the Post-Katrina Reform Act of 2006 made FEMA "become more of an operational agency and not just a check-writing agency" (Respondent 48). FEMA now coordinates information flow and intelligence during federal emergency management operations. The legislation enables FEMA to invest in

preparedness, i.e. contingency planning, training, and large-scale exercises. It also reestablished FEMA's previous focus on hazard mitigation activities with state and local actors, which may promote increased interaction between federal and local actors.

### **7.7.2 State Actors**

State governments exert statutory authority over county and municipal-level agencies. While state policies incentivize cooperation to some extent through grants and other programs, the state's considerable influence over the system is demonstrated primarily by several laws that create the rules under which agencies operate. State legislation and funding, for example, enables the task force infrastructure. These task forces help to regionalize some emergency management activities. Several statutes and policies mandate minimum levels of professional qualifications for police and EMS and encourage them for fire personnel as well. Personnel obtain these qualifications by participating in an educational system that brings people together from across agencies. The opportunity to interact outside of a response situation promotes information exchange and networking. Respondents indicate that several preparedness initiatives have development out of networking during classroom situations. Analysis of semi-structured interviews indicates that recent legislation eliminating many concerns about liability during mutual aid promotes collective action during response activities. In addition, state planning mandates (Title 35) generate intra-municipal interaction as well as limited interaction between those municipalities and county and state actors.

### **7.7.2.1 Counterterrorism, All-Hazards Tasks Forces**

While the federal government contributes to the operations of the task force structure, state legislation defined their boundaries after 9/11. They were created to “promote collaboration among counties within the region and municipalities within the counties” (Respondent 59). Task forces provide another level of government useful in coordinating action across an array of activities (mitigation, preparedness, response, etc.) and are mentioned in more detail above.

### **7.7.2.2 State Grants**

The role of state grants in promoting cooperation between first response agencies is minimal as compared to the funding streams for the tasks forces. First response grants, whether administered through PEMA, the Bureau of EMS, or DCED, do offer some incentives for consolidations and mergers, though. One grant program, enabled by the Emergency Planning and Community Right-to-Know Act of 1986, does facilitate cooperation across sectors to facilitate preparedness activities. Funded by private-sector chemical producers, the Local Emergency Planning Committees (LEPCs) plan for HAZMAT incidents. Allegheny County Emergency Services also use the group of public, private, and nonprofit agencies “in creating a broader, all-hazard plan to mitigate, respond, and recover from an array of potential hazards. (Allegheny County Emergency Services 2010b).

### **7.7.2.3 Qualifications as Opportunities for Interaction**

Respondents at the state level maintain that minimum qualifications for emergency managers improve the efficacy of their work, while also promoting interaction between levels of government. Respondent 55 indicated that “organizations have a responsibility to get a certain

amount of training for response and recovery. The county has responsibility to educate those folks. We have the responsibility to educate and provide the resources for counties to do their jobs.” The Pennsylvania EMS Act (Act 37 of 2009 that amends Act 45 of 1985) outlines minimum standards to be met through participation in Bureau of EMS sanctioned-continuing education courses facilitated through hospital medical command and other entities. The Municipal Police Officer's Education and Training Commission (enabled through Act 120) set basic police standards. The state, however, does not mandate minimum qualifications for fire personnel; rather, the State Fire Commissioner recommends curricula taught by the state fire academy, community colleges, and county fire academies. These educational and state minimum qualification standards and venues provide opportunities and incentives for interaction and networking that occasionally spark professional relationships that lead to some type of interorganizational cooperation.

#### **7.7.2.4 Immunity from Liability**

Respondents indicated that concerns about liability in the past prevented cooperation in some instances. With no state-sponsored template, mutual aid agreements were costly in terms of time and money depending on the extent to which municipal solicitors were involved. Two recent pieces of legislation, Act 93 and the Statewide Municipal Police Jurisdiction Act, however, give outside fire and police departments immunity from liability if they are requested by home agencies. Act 93, Respondent 9 explained, “allows local governments to request the assistance of other local governments without the worry of who is responsible for workers comp... Departments now [mutual aid] without formal, signed mutual aid agreements.” Statewide Municipal Police Jurisdiction Act performs the same function for police departments. EMS also mutual aid without signed agreements. “We used to have to have a written contract



signed by the outlying municipalities for mutual aid,” Respondent 32 indicated. “We are not required anymore to have them signed. We just get called...”

#### **7.7.2.5 Mandated Municipal Planning**

Title 35 mandates that municipalities draft and update emergency operations plans per state-created templates. Analysis finds that agencies invest varying amounts of time and resources in complying with the statute. The statute requires formalized, written plans, but does not force the municipalities to work with their agencies to generate documents. Municipalities also vary in the extent to which their agencies work together in drafting and updating their plans. The state mandate offers an opportunity for municipality emergency management coordinators and others to work together. Findings are clear, however, that all agencies are aware of the process and most take part in it. While state and county personnel do not evaluate the plans, they do by law receive them from the municipality.

#### **7.7.3 County Actors**

As outlined in Chapters 4 and 5, County Emergency Services exert significant influence over response operations through the county 9-1-1 dispatch center. The section below will outline how they influence communications (and situational awareness) through the assignment of radio frequencies to first response agencies. Emergency Services play a major role programmatically in coordinating emergency management and EMS meetings as well as large-scale (multidisciplinary) training exercises. As defined in Title 35, they distribute and collect the state-mandated municipal emergency operations plan template.

#### **7.7.4 Municipal Actors**

The disposition of municipal management toward cooperation is generally quite positive. However, a small minority of decision makers demonstrate hostility toward the allocation of resources (time, personnel, material, etc.) to neighboring municipalities. Respondent 10's comment underlies this position. "Our elected officials' viewpoint was that we are paying all this money for you to work here, why do you keep running to [our neighbors]?" Respondent 50 indicated the same problem among neighbors. "I've heard stories of fire departments catching heat from their municipal fathers who didn't want them going to other communities because it made them a busier department and created more of a risk for injury. It was more costly on their workmen's comp insurance provider." Act 93 and the Statewide Municipal Police Jurisdiction Act should help to eliminate concerns about liability and reduce insurance rates. While municipal leaders could direct first responders, either formally or informally, to limit mutual aid, most appear to support mutual aid for nothing else than as an insurance policy in case of a large-scale incident in their jurisdiction.

The interaction between first responders and their municipal governments appears to be escalating. Municipalities increasingly coordinate administrative activities with their nonprofit fire and EMS agencies. In 2008, state Acts 7, 8, 9, and 31 officially put the responsibility of providing fire and EMS services in the portfolios of local governments. Chapter 5 illustrates the increasing contributions of municipal governments to nonprofit first responders. This municipal policy shift increases the levels of cooperation between municipal governments and first responders.

## 7.8 CONCLUSION

Components of administrative structure range from rules to resources to technical infrastructures. The demands of the external environment shape and constrain organizational action. Problems create certain needs that foster common cause and complementary goals that are either formally espoused through organizational policies or informally pursued. Analysis of the network data shows the positive roles played by geographic location and conceptual proximity.

This chapter demonstrates the influence of actors situated from the federal to municipal levels of government. Influential actors create rules that promote collective action. In particular, state legislation has reduced liability concerns and promoted cooperation. At the same time, policies at the county and municipal levels place limitations on who has access to the information infrastructure and when. Analysis of semi-structured interviews indicates that the field study area's information infrastructure, while on a positive trajectory in reducing information asymmetry, limits the extent to which agencies receive and exchange data critical to decision making regarding collective action.

## **8.0 COMPONENTS OF ADMINISTRATIVE PROCESS THAT INFLUENCE COOPERATION**

“It all boils down to communication” (Respondent 10).

Chapter 7 suggests that access to information creates a common operating picture that promotes cooperation. This access is facilitated by an information infrastructure, by rules that permit participation, and by geographic and conceptual proximity to other agencies. Components of administrative structure, however, are not the only factors that influence the formation of a shared knowledge base and a common operating picture. What are the components of administrative process that affect interorganizational cooperation? A key element of administrative process is communication or as Simon (1997) defines it, “any process whereby decisional premises are transmitted from one member of [a system] to another” (p. 208). The components of administrative process, explored in this section, affect the extent to which communication takes place, which shape and constrain decision making regarding collective action. Culture, leadership, management skills, preexisting relationships, and individual and group incentives all influence communication and the policy decisions agencies make regarding whether to pursue strategies of interorganizational cooperation.

The creation and maintenance of relationships stands out as critical processes that facilitate information exchange and trust building so vital to cooperation. This chapter also

identifies “multiple hatters” or boundary spanners who possess multiple organizational memberships and connect agencies together, promoting interaction. The alternative to cooperation, as outlined in this chapter, is a siloed pattern of activity perpetuated by turf protection and a “go-it-alone” mentality that dominates some organizational cultures.

## **8.1 CULTURE**

“Inherently emergency management is cooperative in nature” (Respondent 55).

Analysis of semi-structured interviews indicates that several components of organizational culture influence the particular dispositions of managers toward cooperation. The comment above reflects the idea that organizational culture in emergency management is inclined to support cooperation. While mutual aid is a generally accepted practice, organizational culture is more or less supportive of cooperation depending on particular cooperative activities and partners.

### **8.1.1 Types of Culture that Promote Cooperation**

Schein (1992) describes organizational culture as “a pattern of shared basic assumptions that the group learn[s]” and is “taught to new members as the correct way to perceive, think, and feel” (p. 12). These patterns of basic assumptions regarding interorganizational cooperation include: 1.) The extent to which agencies value information sharing, 2.) Their openness to new information,

3.) Their commitment to emergency management as a mission, 4.) Their commitment to other personnel, and 5.) Their commitment to the public good as a whole.

Agencies that value learning and information exchange may be more willing to explore strategies for collective action. Agencies that exhibit a commitment to solve problems through flexibility and hard work provide a motivating force for cooperation. “The fire service that I’ve experienced over the past 30 years is that we have a can-do attitude,” Respondent 50 stated. “No matter what the problem is or what the issue is, we are going to find a way to solve it because we never want to say that we failed.” The commitment to problem solving described above may lead to information search and exchange. If decision makers recognize strategies for collective action as a solution to a specific problem, agencies open to new strategies and ideas are more willing to interact with others.

Respondents referred to emergency management as a “family,” a “fraternity,” and a “brotherhood.” The perception of emergency management as a single system in which interdependent personnel operate facilitates an openness to collective action. It promotes a reciprocal notion among personnel that they ought to protect each other, a mentality of “I’ve got your back” (Respondent 22). Personnel demonstrate commitment to organizational missions as well as to members of their disciplines and emergency management as a system. As cooperation is increasingly a norm within emergency management, professionalism promotes interorganizational cooperation (McGuire 2009). Several respondents (three fire chiefs, three police chiefs, one EMS director, and one federal-level personnel) cited their mission as specific disciplines or emergency management as a cultural impetus to cooperate.

Some agencies demonstrate a strong commitment to others in their discipline. For example, a police chief described his support of other police in need of assistance. “When it

involves another police department, we are policemen. It doesn't matter where you work. In situations where there is a policeman hurt or down, it doesn't matter" (Response 26). Mutual aid demonstrates personnel's commitment and loyalty to each other. It has become an accepted practice among fire, police, and EMS. For practical reasons, in addition to loyalty, "[our department] appreciates the help" Respondent 39, a fire chief, indicated. "You aren't getting beat to death. Our initial attack crew might only get in one time, but it's better than getting beat to death and dragging ass."

Agencies that demonstrate a commitment to emergency management in addition to their individual disciplines, generally, are more willing to participate in cooperative activities. The remarks of one police chief, Respondent 26, reflect the commitment to first response. "We are considered first responders, so we go on all of the calls. Whether it's a fire or an automobile accident, we are usually there." Respondent 25 spoke to the commitment of emergency personnel to protect one another. "That brother fraternity environment that people talk about is there. We assist each other as best we can."

The commitment to protection and support of other agency personnel promotes cooperation. "If a person puts their hands on a paramedic... if they pushed or punched a paramedic, they were in a county jail two minutes later. EMS knew we backed them up" (Respondent 22). Chapter 5 outlines other forms of protection that first responders provide one another. This type of support generates good will and dependence, which helps to link the system together.

## **8.1.2 Types of Culture that Inhibit Cooperation**

“When an opportunity to simply join a [collaborative] project comes up, people’s defenses come up because they fear loss of control, loss of pride, loss of integrity,” Respondent 51 remarked. “Sometimes it gets all the way down to the local officials feeling that cooperation diffuses prestige or power in the local community,” he added. This comment speaks to the fear of agencies (ingrained in a basic set of shared assumptions) that cooperation reduces control, power, authority, and prestige. In the face of these fears, agency decision makers may focus on their existing routines and rely on their existing bases of knowledge, which reinforces established practices and patterns of interaction (or lack thereof).

The present study supports the extant literature that recognizes turf protection and suspicious organizational cultures as factors that reduce the likelihood for cooperation (Bardach 1998). I identify cultural misperceptions between disciplines, the animosity between some paid and unpaid personnel, the existence of “pride,” and the unwillingness to share information as the manifestations of cultures that inhibit interorganizational cooperation.

### **8.1.2.1 Turf Protection**

“Turf protection... first responders are worried about losing their authority” (Respondent 31).

Acts of “turf protection” inhibit collective action. Why do agencies exhibit turf protection? Fears of forced consolidation, loss of organizational identify, and the loss of power and authority motivate turf protection or territorialism in the field study area. Four fire chiefs, three EMS director, two police chiefs, one regional-level personnel, and one state-level



personnel cited these factors in some way contributing to turf protection. “People have concerns about other agencies taking you over,” Respondent 34 explained. A council of governments’ administrator spoke of the suspicion of local departments toward cooperative activities. “There was concern that we as a COG would take over departments and it took several months for the chiefs to become comfortable with what we were trying to do” (Respondent 51). An EMS director, Respondent 37, identified the same suspicion. “For years and years [a large neighboring agency] and [my agency] were considered threats... But neither of us went out and tried to get anybody else. We still provided mutual aid... We could interact... but [smaller agencies] kept their distance from us.” This weariness or fear of forced consolidation inhibits more robust cooperation.

With no externally-mandated consolidations, the fear of a forced “take over” appears to be unfounded. Why then the suspicion of regional administrative programs? One reason is simply the loss of identity and control. “The smallest volunteer fire department; their chief is a chief. I believe their biggest fear is loss of power both as a chief and as a membership group. And they fear the loss of their identity,” Respondent 5 explained. “They fear that their department identity will be lost and that 70 years of tradition will be lost.”

Turf protection comes at a price. “There could be so much more in terms of partnerships to make the system better, but it just comes down to egos and taking away my power. It drives me crazy,” Respondent 31 concluded. “With all of the headaches out there, we are own worst nightmares in the discipline. We want to maintain our own identity and autonomy instead of looking at the economy,” Respondent 50 offered.

### **8.1.2.2 Paid vs. Volunteer Personnel**

“There is a separation of us versus them, career versus volunteer” (Respondent 28).

In Pennsylvania, volunteers staff the vast majority of fire departments. Of the 14 municipal fire chiefs interviewed, seven chiefs plus two state-level personnel identified the division between paid and unpaid firefighters as a factor inhibiting cooperation. “The paid personnel won’t even mess with volunteers,” Respondent 2 remarked. The division is perpetuated by negative assumptions held by personnel. The resistance of paid personnel in working with volunteers is a result of several factors. Some paid personnel expect lower standards of performance from volunteers. On the other hand, some volunteers insist that the lack of interest is due to paid personnel’s unwillingness to engage in “extra work.”

To some extent, paid personnel expect lower standards of performance from unpaid personnel. “It’s the perception that career people think they are better than the volunteers. They think they are better because they get paid to do what they do” (Respondent 2). Some paid personnel feel “they [volunteers] have not been trained properly” (Respondent 17).

Some paid departments do not recognize the incentives to pursue the regional public good as their responsibilities focus specifically on their municipality. Paid personnel expect remuneration for their work. In the absence of municipal direction, paid personnel do not have the incentive for interorganizational cooperation. “On the career side, there are people who only see it as their job. They are not interested in the kind of activities like training with other municipalities” (Respondent 2). Volunteer departments, with few exceptions, exhibit more willingness to interact with others. They depend on others to supplement manpower and

equipment levels. Paid departments generally maintain sufficient staffing levels that allow them to handle the majority of emergency calls independently.

Some volunteer personnel resist supporting paid personnel on certain types of calls. Respondent 5 stated “you get a call at three o’clock in the morning and the volunteer says why should I come out and babysit the paid guys. Why should I come out for this wire that’s down when that’s what you get paid for?” Several respondents have overcome barriers between volunteer and paid departments. “You have to swallow the fact that you are working with paid people. I am volunteer; you are paid. Why am I doing this? Because I ain’t getting nothing out of it except the fact that I am helping citizens,” Respondent 11 remarked. “Once you overcome that and that it works the other way where a paid employee says what are you doing here when we could have another guy out here on overtime. You have to overcome that resistance to that theory of working.”

### **8.1.2.3 Negative Perceptions of Other Disciplines**

“Let’s face it, I’ve had policeman complain about firemen and firemen complain about policemen” (Respondent 29)

In some situations, stereotypes about other disciplines create negative assumptions about interorganizational and interdisciplinary cooperation. The rivalry between fire and police in particular appears to inhibit the development of strong working relationships. Some police and fire do not hold EMS in the same esteem as other first responders. “To put it differently, they are not part of the family” Respondent 24, a police chief, proclaimed. That opinion, however, is in the minority of respondents.

Divisions between disciplines are evident. “Some police look down on volunteer firefighters. They even have funny names for them. They call them ‘wackers’ or ‘blue lighters.’ That doesn’t really happen here because we see a good group of dedicated guys who are really fast at coming out” (Respondent 22). The negative cultural perception across disciplines can be exacerbated by the lack of existing relationships to dispel misnomers. Respondent 50 indicates that “when you have a department with no relationships, it’s easier to perceive a department as just dumb volunteer firemen. Or an overbearing cop...”

I asked a police chief whether he thought that cultural perceptions of other disciplines were based on attributes such as paid versus unpaid personnel or high standards of performance versus low standards. His answer was instructive:

It could be that. But it could also be when someone is different than you, you just look at them differently. Does the FBI look down on the state police? Does the state police look down on local police? Do we look down upon the [university] police? It seems like someone is always looking to look down on someone else because you are different... You think you’re the best. It’s just like that word ethnocentricity. I’m from one culture you’re from another. I look down on you. It’s just differences sometimes I think people look down on other services (Respondent 22).

These negative perceptions can be overcome by developing relationships, interaction, and positive organizational learning. Also, negative perceptions can be overcome by the belief that each discipline is part of a larger first response community. “Everyone here [in the municipality] considers themselves as part of a family. So there is none of this fighting in between the fire and police” (Respondent 22).

#### **8.1.2.4 Pride**

“They feel like they are strong enough on their own” (Respondent 5).

Six fire chiefs and two state-level personnel who work with fire departments introduced the concepts of “pride.” Pride, in emergency management, manifests in different ways and influences agencies’ willingness to engage in collective action in different ways. On one hand, an agency’s pride in their tradecraft, equipment, and professionalism increases performance and can engender a commitment to working with other agencies. On the other hand, “pride” can also manifest in the form of fiercely independent departments that consider cooperation as an indication of failure. “I think pride is the mentality that... [the department] can always do it better than the other guy,” Respondent 2 asserted. Respondent 3 explained how this type of pride inhibits mutual aid in the fire discipline. “They see a fire call as their call and if they give up that call somebody will think that I am weak or that I can’t handle it. People don’t want to appear weak. If I need help then whoever is helping will think that I am weak.” Pride creates organizational rigidness that inhibits change. “Pride means that we’ve been doing it this way and we think our way is the best. That [type of thinking] is close minded to new ideas,” (Respondent 34). The risk of the unwillingness to change is the inability to adapt to dynamic conditions. “I know a lot of things work and why change it, but if you want to do more than just get by you have to take some risks (Respondent 29).

### **8.1.2.5 Police as “Lone Rangers”**

“This is a male hormone driven position. These guys are running alpha man 24/7” (Respondent 18).

“The police... they are kind of like the lone ranger,” Respondent 28, a police chief, commented. “Everyone wants... to protect their turf and that’s how policemen are brought up... This is my border. This is what I protect.” This comment characterizes police departments that are focused almost solely on the day-to-day operations of law enforcement within their specific geographic boundaries.

Generally, the types of law enforcement activities pursued by police do not require mutual aid (or back up) for successful completion. “Police for the most part do not use mutual aid very well until such time that the event is a big one. The shooting. The riot... And they do the all-call, the all-come, and the ground-level troops in the adjoining municipalities know each other very well because of that fact” (Respondent 39). However, intradisciplinary mutual aid is not commonplace for the majority of response calls.

With the workload created by the demands of law enforcement, police may not have the time or resources to concentrate on emergency management. In practice, police departments value their law enforcement function. That is their profession, more so than any perception they might carry as first responders or emergency managers. This mentality leads departments to focus on law enforcement activities at the expense of emergency management work. The high volume of police calls explains the practicality of this policy decision.

Police departments that fail to value their role as first responders or emergency managers exhibit less of an interest and willingness to cooperate with other disciplines. If an agency's culture only values law enforcement, their operational focus will remain with law enforcement-related activities.

#### **8.1.2.6 Unwillingness to Share Information**

“...And information is power” (Respondent 46).

Interoperability is the ability to communicate as necessary. However, interoperability is not only the technical ability to share information or the rules that govern information exchange; it also encapsulates the willingness of agencies to share. Examination of the data from the interviews identifies three reasons why agencies are unwilling to share information, 1.) Information is power and some agencies hoard power; 2). Some agencies are constrained by regulations such as restrictions in sharing law enforcement-related information, and 3.) Some agencies are not in the habit of sharing. They do not have regular contact with other agencies or they do not have the appropriate information technology to share relevant information. Agencies may be reluctant to share information because they are complacent with their established routines. “If it ain't broke, don't fix it,” Respondent 29 asserted, characterizing the mentality of some siloed departments. “There are those who will always rather... tightly control information. They won't want to let it get out there. Because they perceive that they will control it. And information is power” (Respondent 46). The inability or unwillingness to search for and exchange information limits agencies' ability to recognize cooperative opportunities.

## 8.2 LEADERSHIP

“You can’t have a paper fire chief. You have to have somebody with their boots wet and hands dirty” (Respondent 11).

Leadership is the “ability to step outside the culture that created the leader and to start evolutionary change processes that are more adaptive” (Schein 1992, p. 2). An effective leader recognizes a problem, articulates a goal, and communicates an action strategy to solve the problem. Leadership that recognizes the value of cooperative activities and will challenge organizational barriers to cooperation increases the likelihood for cooperation (Bardach 1998). “It all starts with the chief,” Respondent 16 summed up. Respondents recognized the importance of leadership as characterized by the following statement made by a municipal police chief. “Everything starts at the top, in my opinion. If you have a chief that sets the example that we are all brothers out here in the public safety community; let’s work with each other, let’s respect each other, let’s help each other...” (Respondent 22). As the public safety and emergency service personnel, generally, respect the chain of command, the directives and examples set by management influence the actions of frontline personnel.<sup>31</sup>

The experience and disposition of leaders toward cooperation varies within the field study area. Exercising visible leadership offers personnel an example to be emulated. In

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<sup>31</sup> Culture and the values of priorities of agency personnel are particularly germane to policy decisions whether to cooperate in volunteer fire departments. Because membership makes decisions, “internal department politics and desires” directly affect decision making “because... most fire departments are run by their membership at large... A chief can very easily be overruled by his membership” (Respondent 12).



conditions characterized by change, personnel may not recognize what organizational routines should be employed, so emulation of leadership represents a common sense alternative (Axelrod and Cohen 1999). Many respondents indicated the positive role chiefs and agency directors play in promoting mutual aid and joint preparedness activities.

Some leaders promote cooperation; others impede it. Regarding the fire discipline, some respondents indicated that while most volunteer fire chiefs are tactically accomplished, their vision and scope as emergency managers may be limited to the types of fire calls that take place on a regular basis. The inability to recognize vulnerability to less frequent, more destructive threats inhibits preparation and other types of cooperative activities. Without the justification to engage in new activities, fire chiefs already constrained by operational and administrative responsibilities are less likely to pursue joint activities.

Some fire chiefs come about their positions as a result of “popularity contests” as volunteer departments generally elect their chiefs from their general membership (Respondent 17). Respondent 12 indicated that the election process is “not necessarily based on firefighting experience, fire science knowledge, administrative and ability.” In cases where chiefs are “not managers” and “don’t have those innate leadership qualities,” the inability of a chief to articulate support of interorganizational cooperation may impede cooperation.<sup>32</sup>

Another component of organizational leadership that influences cooperation, according to respondents, is the rate of turnover of leadership. Four fire chiefs and a state official cited

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<sup>32</sup> Respondents indicated the wide range of experiences and abilities demonstrated by personnel across the emergency management disciplines. For example, “today emergency coordinators are diverse. We have them all the way from people who have barely finished elementary school to doctors and people who do postdoc work and who have many experiences” (Respondents 46).

turnover as a barrier to collective action. Respondent 55 commented that “in some areas, historically, there is a political culture where there is a turnover of staff. And that harms collaboration. The counties that see more stability, where they have 10-year coordinators, they seem to be more collaborative.” Respondent 8 explained why. “I think it’s much better to have steady leadership. I think that continuity is beneficial to the department. You know what to expect. You can put plans together. The experience is just invaluable” (Respondent 8).

### **8.3 MANAGEMENT SKILLS**

“We try to avoid the cookie-cutter approach to having everything be exactly the same. We would like to have the same outcome, but how one gets there can be different” (Respondent 55).

The ability of a leader to step outside of the constraints of organizational culture and lay out a supportive vision plays a role in promoting cooperation. Once a policy is made, however, what types of management skills facilitate the creation and maintenance of cooperative activities? During response operations, rigid command and control models of emergency management often break down. Managers who take a more flexible approach to coordination achieve higher levels of efficacy (Mendonça 2007; Comfort 2002; Neal and Phillips 1995). Management skills that support flexibility facilitate collective action. Goldsmith and Eggers (2004) lay out several traits that facilitate the management of interorganizational networks, including “big-picture thinking, coaching, mediation, negotiation, risk analysis, contract management, ability to tackle unconventional problems, strategic thinking, interpersonal communications, project and business management, and team building skills” (Goldsmith and Eggers 2004, p. 158). Analysis of semi-

structured interviews confirms the presence of these traits (especially risk analysis, negotiation, and interpersonal communication) in network relationships throughout multiple-levels of government.

Interpersonal communication skills that facilitate information search and exchange represent key characteristics of strong emergency managers promoting cooperation. “When you look at interpersonal skills, team building skills, those are the kind of skills that an emergency manager needs,” (Respondent 57). One strategy to develop interpersonal communication is to reach out to other agencies prior to situations characterized by urgent need. “You have to spend the time upfront building relationships, and be diplomatic,” (Respondent 42).

The ability to delegate promotes cooperation. The inability or unwillingness to delegate during an incident inhibits cooperation. “The division of work is the biggest issue. Somebody needs to be there and aware of the situation who can effectively and appropriately divide the work, [so] teams can work together more efficiently,” (Respondent 33).

The ability to delegate depends on an emergency manager’s cognition, or his or her ability to recognize need and develop strategies for action. “Emergency managers have to have the ability to think in levels of complexity. A good emergency manager can see complexity and can see how that complexity interrelates with each other and is able to come up with solutions” (Respondent 56).

During response operations, emergency managers balance the operational efficacy of command and control with the flexibility of open communications and problem solving strategies. Information exchange and effective interpersonal communication is critical. “When we get to the scene of a fire, we cooperate with one another. We consult with one another and give suggestions back and forth, but the local chief makes the final decision” (Respondent 16).

#### **8.4 ROLE OF RELATIONSHIPS**

“It comes down to the relationships” (Respondent 10).

“This stuff isn’t rocket science. It’s about developing relationships and knowing each other. The better you know the group you are working with, the better off things go especially during emergencies” (Respondent 50).

Respondents identified a number of factors related to interpersonal relationships that influenced collective action. First, friendships and acquaintanceships promote cooperation by establishing trust. Personality conflicts, conversely, inhibit collective action. More formal relationships that occur by the way of cross organizational membership promote interaction. A specific type of boundary spanner within the field study area commonly referred to as a “double” or “multiple hatter” participates in multiple agencies as either paid or volunteer staff. Their multiple memberships help to cross pollinate the existing bases of institutional knowledge with information gained by both formal and informal networks of friends and colleagues.

### 8.4.1 Positive Relationships

“If a friend does something stupid... it softens the blow and it makes [the problem] go away easier” (Respondent 50).

Preexisting relationships facilitate information search and exchange. Positive relationships between members of different agencies clearly help to minimize barriers to collective action and promote interaction in the field study area. Respondents overwhelmingly cited the role of positive relationships in promoting collective action (fourteen fire chiefs, six police chiefs, four EMS directors, two county-level personnel, two state-level personnel, and a regional official). Table 44 demonstrates the breakdown of respondents by discipline. The high percentage of fire personnel (77.78 percent) indicates the particular importance of positive relationships in the fire discipline.

**Table 44: Frequency Distribution of Respondents Identifying Positive Relationships by Discipline**

<b>Discipline</b>	<b># Identifying Concept</b>	<b>Total # of Respondents</b>	<b>% Total</b>
Fire	14	18	77.78
Police	6	14	42.86
EMS	5	13	38.46
Emergency Mgmt	3	13	23.08
Other	1	5	20
<i>Total</i>	29	63	46.03

Several factors help to develop and maintain strong relationships. Mutual respect, trust, reciprocity, and the expectation for future interaction promote interaction (reaffirming Axelrod 1984 and Putnam 2000). Positive personal relationships, while not necessary for mutual aid,

promote interorganizational cooperation across multiple activities. Respondents vary in their opinion regarding the extent to which maintaining positive relationships facilitates cooperation. On the one hand, most respondents emphasize the importance of strong relationships. Respondent 4 argued the importance of preexisting relationships. “If you don’t get along with them they are not going to come and help you.” Respondent 14 echoed those comments. “You can’t work together if there were any animosities. You won’t get the help out of them.”

Respondent 9, a fire chief, explained how he was introduced to a chief who later provided his department with a rapid intervention team. “This old fire chief introduced me to him, and I met him in a drinking establishment... He introduced me to his guys. He told me about his rapid intervention team... which got me interested.” The informal encounter described above prompted the two departments to recognize an opportunity for collective action and formalize their relationships with a policy decision to mutual aid on rapid intervention.

Preexisting relationships may facilitate communication about controversial subject matter. Where other managers may sidestep confrontation, managers with preexisting relationships may feel freer to address controversy. Respondent 10 explained how preexisting knowledge of how his colleagues interact encourages him to address matters directly. “If I’m angry, I’m going to get on the phone and say ‘hey, what the hell is going on here?’ You see people that hold it in then bear a grudge for the next 30 years. I don’t hesitate to get on the phone to air a problem.”

On the other hand, some agencies rely on standards of performance such as professionalism to ensure at a minimum, mutual aid support. “People have to remain at a professional level when they are out here,” Respondent 13 argued. “You can have a personal

relationship with somebody on your own time, but it comes down to people knowing their roles and responsibilities. It's about knowing that when incident occurs, it's all business.”

“I always say you want to develop relationships with people long before anything happens” (Respondent 10). This comment supports the notion that preparedness facilitates operational success. Knowing who to call for what and knowing how to approach people effectively in conditions of urgent stress is facilitated by information gained during previous interaction. “I think it is sort of personality driven. If the chiefs are friends or at least collegial, there is less of an issue [coordinating]” (Respondent 35).

#### **8.4.2 Personality Conflicts**

“There are people in this business that don't like each other” (Respondent 23).

Personality conflicts negatively affect the levels of cooperation achieved on activities other than mutual aid. Several respondents acknowledge that while the vast majority of their relationships are positive, personality disputes inhibit cooperation, particularly activities in which urgent need is not recognized such as preparedness, incident prevention, and administration. According to Table 45, EMS dominates the respondents who mentioned personality conflicts. Six managers singled out its negative role as did two fire chiefs, two police chiefs, and two state-level personnel. While the relatively low percentage of respondents (19.05 percent) who recognize personality conflicts as a barrier does not indicate a widespread problem, personality conflicts still cause problems within the system, particularly among certain EMS agencies.

**Table 45: Frequency Distribution of Respondents Identifying Personality Conflicts by Discipline**

<b>Discipline</b>	<b># Identifying Concept</b>	<b>Total # of Respondents</b>	<b>% Total</b>
Fire	2	18	11.11
Police	2	14	14.29
EMS	6	13	46.15
Emergency Mgmt	1	13	7.69
Other	1	5	20
<i>Total</i>	12	63	19.05

Mutual aid occurs in a different context where need is clear. “I’ve got guys here that don’t like guys in [in our neighboring department]. And vice versa. It’s just personality conflicts,” Respondent 23 indicated. “But when it comes down to when you need help, all of that shit is set aside. Some guys drive a little slower, some guys drive a little faster, but they get there.” While agencies work together in conditions of urgent need, Respondent 23’s comments about “driving slower” are instructive because personality conflicts still exist in the face of a pressing event.

### **8.4.3 The Maintenance of Relationships**

Respondents identified several factors that help develop and maintain relationships. Knowing how to read people, developing respect and trust, engendering reciprocity, and interacting with others outside of an incident command environment are identified as factors. These factors help to maintain governance networks and facilitate work on a large scale.



#### **8.4.3.1 Knowing How to Read People**

“You can’t yell and scream and fight with them” (Respondent 4).

“You really got to be able to read the person you are dealing with and know what approach to take with them. One of the other fire chiefs that I routinely deal with is quite the hot head. You have to be careful. You have to know when to talk to him,” Respondent 8 offered. Communicating through preferred media also facilitates continued interaction. “I communicate with some of the chiefs via e-mail. I communicate with some of the other ones via cell phone. I think it’s easier to get a hold of people through e-mail sometimes. People have their different preferences. And learn them” (Respondent 8).

Respondent 4 emphasized “just getting along.” He suggested that chiefs at times do not agree about tactical decisions at an incident. “You can’t yell and scream and fight with them,” Respondent 4 asserted. “When they call, you go and help them... Afterwards you say hey our guys have been doing another way. Sometimes the chief says okay next time we will too.” (Respondent 4).

#### **8.4.3.2 The Development of Trust and Mutual Respect**

“I think it’s just mutual respect and knowing that we are all in the same boat” (Respondent 35).

Cooperation is more likely when potential participants desire to reciprocate for past interaction (Axelrod 1984). Trust develops in situations where actors are familiar with each other, interact overtime, and develop respect for one another (La Porte and Metlay 1996). Trust

lowers transaction costs and other barriers to cooperation (Feiock 2007). Analysis of semi-structured interviews identifies the positive role that “mutual respect” and trust plays in promoting cooperation. Respect is developed during interactions. “I think it's about sharing experience, sharing knowledge, asking about things that they might have occurred... that's the easiest way that the relationships have developed and been maintained. You earn some respect” (Respondent 35).

Analysis of the semi-structured interviews identified that agencies generally consider trust to be the preexisting demonstration of professional standards of performance. Agencies can trust others to get the job done and meet expectations. Like trust, agency personnel develop respect for one another and their professional abilities. I explore these standards of professional performance (or “professional capital”) in the Chapter 9.

### **8.4.3.3 Reciprocity**

“It comes down to you scratch my back and I'll scratch your back...” (Respondent 13).

Axelrod (1984) finds that reciprocity in anticipation of future interaction facilitates cooperation. To maintain cooperation, two key conditions include that “cooperation [is] based on reciprocity, and that the shadow of the future is important enough to make this reciprocity stable” (Axelrod 1984 p. 173). Analysis of the semi-structured interviews clearly identifies reciprocity as a driver for cooperation. Maintaining strong relationships “starts with working together every day and assisting on mutual aid” (Respondent 21). Emergency managers, especially those who interact on a regular basis, anticipate future interaction. “It's not that we are just giving somebody else something. Down the road, they can help us” (Respondent 23).

Respondents expect a good turn in the future. That expectation, in part, motivates the decision to cooperate.

#### **8.4.3.4 Interacting outside of an Incident Response Environment**

“Some chiefs socialize. You get together. You talk” (Respondent 12).

Analysis of the semi-structured interviews reveals that many agencies create and maintain relationships outside of an emergency response environment. These opportunities include both formal organizational settings and more informal settings. Like the story of the fire chiefs establishing a rapid intervention, mutual aid agreement over a beer, personnel develop relationships in informal, as well as formal, environments. Respondent 12 outlined planned, non-operational settings in which agency personnel would interact.

We used to have cookouts at the station. We would call up other departments and say ‘if you’re not doing anything, come over to the station.’ I would talk to chiefs to find out if they had guys who needed certain levels of training and I would pair them up with people in my station who needed the same level. If we needed the same amount of training I would organize a class and call some instructors in and have it at the station. That sort of thing will help to build relationships with chiefs from other departments.

Interaction also occurs in more formal venues. Chief meetings, county-sponsored local emergency management coordinator meetings, the Allegheny County EMS Council meetings, Region 13, and other meetings provide opportunities where “you network, you talk, you pass along information. [People] are able to put a face to a voice to a name” (Respondent 27). Respondent 16, a fire chief, organizes annual department banquets with networking in mind. “We invite our mutual aid companies. We invite the county chief in. This is an evening... we reward the membership for hours attended. And we give out awards for things of this nature. A few beers and talk.”

#### 8.4.4 “Multiple Hatters” as Boundary Spanners

In 2007, Robert Agranoff identified “interorganizational boundary spanners” as actors that facilitate cooperation in administrative settings. The present study identifies a specific type of boundary spanners, “multiple hatters,” who are either paid or volunteer personnel participating in the activities of more than one agency as members. For example, a paid police who takes his or her cap off after a shift and dons a volunteer fire helmet at night is a “double hatter.” Twenty two respondents cited multiple hatters as a positive influence in promoting collective action. Fire (nine chiefs) and EMS (six directors) in particular identify multiple hatters, which indicates that these types of personnel play a significant role in promoting cooperation in these two disciplines. Police (three chiefs) are less likely to employ these boundary spanners even though they still play a role in several police agencies. Other state, county, regional, and municipal agencies recognized the positive contribution of multiple hatters.

**Table 46: Frequency Distribution of Respondents Identifying Multiple Hatters by Discipline**

<b>Discipline</b>	<b># Identifying Concept</b>	<b>Total # of Respondents</b>	<b>% Total</b>
Fire	9	18	50.00
Police	3	14	21.43
EMS	6	13	46.15
Emergency Mgmt	3	13	23.08
Other	0	5	0
<i>Total</i>	21	63	33.33

What role do “multiple hatters” play in promoting cooperation? Several organizational affiliations facilitate the “cross pollination” of the emergency management system; that is they increase information exchange between agencies and increase the likelihood of cooperation.

Agranoff (2007) defines his “interorganizational boundary spanner” as someone who “works within an organization but whose primary and often exclusive duties are engagement of personnel of external organizations” (p. 18). Large agencies generally are more likely to have the personnel to dedicate to cooperative activities. In the field study area, some large agencies dedicate personnel to emergency management planning or mutual aid and preparedness coordination. Some personnel are formally appointed to serve as liaisons with other agencies or as representatives to municipal, regional, and county-wide planning sessions. However, many smaller agencies lack the resources to devote personnel exclusively to cross-boundary purposes. Instead, relationship building depends on less former roles. The presence of “multiple hatters” or personnel that participate as members of other agencies is more prevalent than formally assigned boundary spanners. Both types of personnel increase the flow of information from one agency to another. With increased information comes the recognition of potential points for collaboration.

Analysis of semi-structured interviews identifies several types of joint membership that cross pollinate the field study area. Police, particularly part-time police, also work as 9-1-1 dispatchers and paramedics. Some serve as volunteer firefighters and HAZMAT responders. Volunteer firefighters participate in similar activities more frequently. Police, fire, and EMS agency heads from across the field study area serve as their municipality’s local emergency management coordinator. With respect to other levels of government, some emergency managers volunteer as first responders to stay close to the problems and professional skill sets of the disciplines. With respect to operational teams and task forces, emergency managers generally wear several hats.

There is some criticism of multiple hatters, particularly of those with high ranking positions. One perspective mentioned by more than one respondent was that multiple hatters

during a large-scale incident must choose where to concentrate their efforts, which may leave other areas unattended. “I’m not sure that any chief of an emergency service should be the coordinator for the municipality. The reason I feel that way is it takes away from interorganizational coordination. The chief of police, the fire chief, the chief of the EMS have enough on their plates to worry about” (Respondent 12).

## **8.5 INDIVIDUAL AND GROUP INCENTIVES**

Individual personnel may be motivated to facilitate cooperative activities to advance their careers, increase their organization’s resources, or simply create public value (Bardach 1998). Thurmaier and Wood (2002) argue that local government personnel are motivated, not solely by cost benefit ratios, but by their desire to help their neighbors (a public value creating incentive). Analysis of semi-structured interviews identifies this type of value-creating incentive as a major influence. On the first responder-level, individual goals center on meeting the demands of the external environment. Chapter 7 highlights how the immediate need for manpower and other resources drive interorganizational cooperation. Understanding how individual incentives augment policy decisions to work together increases the understanding of the factors that promote and inhibit cooperation.

Interorganizational cooperation (mutual aid, in particular) offers personnel opportunities to be more active in their discipline. An individual who seeks operational activity finds it regularly in mutual aid. Respondent 4, a fire chief, spoke to opportunities that cooperation

creates. “We’re running about 300 calls a year... about half of which are mutual aid calls. People get to do things a lot instead of just waiting and doing nothing.”

In addition to individual incentives, group incentives motivate personnel to pursue interorganizational cooperation. Firefighters exhibit strong loyalty to their departments. There is a notion that if a job is not completed someone else in the department will be tasked with it. There is a loyalty to their brothers (not only in their departments but also throughout their discipline) which promotes interorganizational cooperation. Incentives motivate people to act in a certain way. Individually, some personnel do not have an individual incentive to participate in interorganizational cooperation, but when they think about their colleagues and they realize that their participation will support their brothers, action is more likely. This loyalty ties back to the commitment personnel exhibit to their disciplines and emergency management as a system.

## **8.6 CONCLUSION**

This chapter identifies the role of administrative process in facilitating collective action. The creation and maintenance of relationships stands out as critical processes that facilitate information exchange and trust building that are vital to cooperation. This chapter also identifies “multiple hatters” or boundary spanners that connect agencies together, promoting interaction. The alternative to cooperation, as outlined in this chapter, is a siloed pattern of activity perpetuated by turf protection and a “go-it-alone” mentality. Chapters 7 and 8 lay out several components of administrative structure and process. Chapter 9 focuses on the threshold factors that influence decision making on collective action and introduces the concept of professional capital.

## **9.0 THRESHOLD POINTS IN THE DECISION MAKING PROCESS**

The policy decision to cooperate is constrained and shaped by elements of both structure and process. The decisions that are made are the outcomes of information exchange and cognition. Elements of either structure or process individually are insufficient in identifying the factors that affect cooperation without acknowledging cognition because cognition offers a glimpse into a person or group's ability to evaluate potential cooperative partners and decide whether to work together.

This chapter argues that cognition and the process of decision making integrate the components of administrative structure and process. Using a complex adaptive systems framework, I have demonstrated the variation among agencies in terms of abilities and strategies for action. I have modeled their patterns of interaction. I have also identified key factors that influence their decision making. Finally, this chapter identifies the process of selection used to determine whether agencies cooperate.

What are the threshold points in the decision-making process regarding whether to cooperate? This chapter identifies the criteria people use to make their decisions. During the interview process, respondents identified a set of professional norms used in deciding whether to interact. These norms when demonstrated engender confidence, confidence that promotes cooperation even in dangerous environments. Conversely, the failure to demonstrate these norms inhibits collective action.



Professional capital represents the standards of professional performance that signal competence and justify the decision to work together. The concepts are demonstrated across disciplines and jurisdictional boundaries. They serve as a basis for a professionalism that appears in different situations varying in terms of intensity and stress.

The recognition of urgent need largely drives cooperation in the field study area. The ability to recognize need is developed through past experiences and the search and exchange of critical information. Once a need is recognized, decision makers determine whether to cooperate with others or rely on their agency's internal capacity to cope with need. Close proximity (geographic and conceptual), as outlined in Chapter 7, influences this decision. However, cases exist in which adjacent agencies fail to work together despite the recognition of need.

While factors such as competition between agencies and personality disputes influence the failure, the present study argues that key standards of professional performance are used by decision makers to decide whether to cooperate. Elements of professional capital, as identified in the semi-structured interviews, include the condition of equipment, the appearance of the personnel, the interaction of personnel, and the operational experience. Respondents identified several emergent topics that influence individual decisions. To a certain extent, transaction costs inhibit cooperation particularly in administrative settings. The present study argues that asset specificity validated through a third-party facilitates the decision to work together.

## **9.1 URGENT NEED AND PROXIMITY**

“I think the biggest reason [for interorganizational cooperation] is need. You just need to work with people nowadays,” Respondent 8 stated. “The departments who have recognized that need are the ones who are working together. It is all need driven. The departments that are smart enough to recognize that need are the ones who are working together.” The comment above emphasizes the role of not just need as a driving force behind interorganizational cooperation, but the ability of an agency to recognize need. Once an agency recognizes a need, they search for a partner for assistance. The analysis of semi-structured interviews and network data clearly demonstrates that close proximity (spatial and to a lesser extent conceptual) plays a major role in the selection process (see Chapter 7). How do agencies recognize need and how do they select their partners? Other than the strategy of selecting their closest neighbor, the concept of cognition helps to explore these questions.

## **9.2 COGNITION**

“The emergency manager should see what it takes to get the incident under control” (Respondent 55).

“A critical component of emergency response is cognition—that is, the capacity to recognize the degree of emerging risk to which a community is exposed and to act on that information,” (Comfort 2007, p 189). Determinants based on either structure or process are insufficient in identifying the factors that affect cooperation without acknowledging cognition because

cognition offers a glimpse into a person or group's ability to problem solve. Identifying cognition facilitates the detection of a person's priorities and thresholds that tell us what a person or group will tolerate in terms of the status quo and conversely what motivates a person to act, including entering into cooperative arrangements. "Cognition provides the initial content and activating link to the subsequent processes of communication, coordination, and control" (Comfort 2007, p. 193).

Managers exhibit varying levels of cognition. High levels enable decision makers to recognize problems, effectively develop solutions, and communicate strategies throughout the system. Lower levels inhibit the process of recognition. The ability to recognize shared risk and formulate strategies for joint-action depends on experience and training (Klein 1993; 2004). Decision makers with positive experiences and/or training with respect to cooperation are more likely to pursue cooperative activities, according to the analysis of the semi-structured interviews. Cognition is facilitated by shared knowledge and the creation of a common operating picture.

"In the language of practice, building a 'common operating picture' is essential for clear communication and coordination of actions among emergency response organizations" (Comfort 2007, p 191). Agencies that search for and exchange information about risk and strategies for action from a common knowledge base are more likely to reach similar conclusions. Chapters 7 and 8 identify components of administrative structure and process that influence communication and the knowledge system in the field study area: the information infrastructure, the system's rules, and informal relationships that influence the flow and feedback of information. The flow of information is the dynamic that drives the decision making process. Chapters 4-8 demonstrate

how heterogeneity of agencies and information asymmetry shape and constrain multilateral decisions to cooperate.

### **9.2.1 Recognition**

“The first responder has to recognize the hazard” (Respondent 33). The initial assessments of first responders shape and constrain decisions regarding mutual aid. If a responder recognizes the need for backup, he or she is more likely (obviously) to request aid. If an emergency manager recognizes risk (potential flooding, landslides, etc.), he or she is more likely to work with other agencies to mitigate that risk. How then do personnel recognize risk and the need for cooperation?

People make sense of ambiguity by considering history, interacting with others, and taking cues from their surroundings. They focus on making plausible interpretations that facilitate problem recognition and corrective action (Weick 1995). People link what they are witnessing with pieces of prior experiences or things they have seen in the past. They take what they recognize and put the pieces together in a new way that helps them to interpret a given situation (Klein 2004). It is only after they recognize a situation that they develop a strategy for action, which may include cooperation.

### **9.2.2 Experience**

Exploring the experience of leaders and frontline personnel alike make possible an understanding of the role that intuition (and experience) play in decision making. Decisions to cooperate in certain situations are made by personnel whose experiences, whether positive or negative,

influence their choices. Without experiences that validate risk, agencies are less inclined to act. One respondent explained how the lack of experience increases the likelihood that an agency will fail to recognize risk. “Nothing has happened to their service or to them where they believe they can’t handle [an incident] or need anybody to help with a large incident” (Respondent 39). In explaining why an agency fails to cooperate, the respondent emphasized the role of past experience in formulating decisions regarding collective action. Experience, obtained during operations, training, or other types of educational activities, drives decision making (Klein 2004; Flin 1996).

Not only does experience provide positive and negative views regarding cooperation; it brings different repertoires of action to draw upon when faced with a problem or opportunities to act. Agencies with limited operational experience may rely on a narrow set of established strategies to respond to a threat. “This is the way that we have always done it” is a mentality that characterizes the culture of an agency with limited strategies according to Respondent 9. Conversely, open and active agencies may have more strategies upon which to draw.

### **9.3 TRANSACTION COSTS**

In the field study area, agencies engage in cooperative activities characterized by informal, nonbinding types of activities. Mutual aid and occasional joint training and planning represent the bulk of interactions. Specific administrative activities in which resources are jointly owned and operated are rare. The costs of negotiating and enforcing financial agreements (transaction costs) represent major barriers to decision makers who consider collective action. The present

study finds that asset specificity (information regarding the level of unique investment needed in joint agreement) facilitates the decision to enter into more formal, asset specific arrangements.

Brown and Potoski (2002) and Feiock (2007) argue that critical information useful in making an informed decision regarding joint service provision or the co-production of a public good include asset specificity and measurability. The ability to clearly identify asset specificity, i.e. the level of unique investment needed to produce a good or service, and measurability, i.e. the ability to measure that good or service, reduces uncertainty and, in turn, lowers transaction costs (Williamson 1975; Andrew 2006).

The few agencies in the field study area that jointly own and operate assets rely on a council of governments to reduce transaction costs and facilitate these cooperative arrangements. This third-party entity clearly identifies asset specificity as well as enforces the joint agreements. With respect to measurability, access to shared equipment as needed is the major criterion valued by participants. Measurability, in this case, concerns questions of access. As agencies feel confident that they will have access to equipment when needed, they are more willing to enter into cooperative agreements.

## 9.4 PROFESSIONAL CAPITAL

“I would hope that they can come in and do the same job that we do. No one is perfect, but you do have some standards” (Respondent 41).

Social capital describes how trust and norms of reciprocity link communities together (Coleman 1988; Putnam 2000).<sup>33</sup> In many instances, trust and norms of reciprocity facilitate collective action without hierarchy (Axelrod 1984; Putnam 2000). However, the present study argues that trust and reciprocity fail to make possible cooperative relationships in some situations in which actors fail to recognize (in potential partners) standards of professional performance that signal competence and justify the decision to work together. These standards serve as key threshold points in the decision making process regarding cooperation. They represent the recognized components of structure and process that facilitate collective action.

What concepts constitute professional capital? More specifically, what are the recognized standards of performance in the field study area that influence the policy decisions of agencies to cooperate? Analysis of semi-structured interviews identifies ten types; physical appearance, customer service, effort, type and status of equipment, experience and training, leadership, operational performance, the use of proper protocols and terminology, and response time. The demonstration of one or several types of professional capital may be enough to prompt cooperation. On the other hand, failing to demonstrate one or several types discourages

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<sup>33</sup> “Whereas physical capital refers to physical objects and human capital refers to the properties of individuals, social capital refers to connections among individuals – social networks and the norms of reciprocity and trustworthiness that arise from them” (Putnam 2000, p. 19).

others from entering into cooperative relationships. Respondent 13 identifies several standards of professional performance, which have inhibited cooperation between his agency and others:

I have seen a fire company taken off our run hard because of previous performance. The reasons are manpower issues, showing up with inadequate crew, showing up with junior firefighters who cannot form inside the building, the equipment that they are coming on and how well prepared the equipment is, and the overall level of coordination with the company. Those were the factors that led to our department to take off another department from our record.

It is rare for agencies not to work with their neighbors, particularly during response operations. The lack of resources and personnel alone is insufficient to explain why and when agencies work together. There are instances where these conditions exist, but managers still refuse to cooperate. Why? In many cases, it is because their prospective partner fails to demonstrate competence in their field. This notion of professional capital depends on decision-makers recognizing competence across disciplines and across jurisdictions. The following criteria represent an emergent list of standards identified by several respondents.

#### **9.4.1 Appearance of Personnel**

Three respondents, two EMS directors and a fire chief, cited the appearance of personnel as a standard of professional performance that they use to decide whether to continue working with an agency. “The person who is the paramedic on the call if he has on greasy hair you ask ‘do I want that person working on me?’ just based on appearance” (Respondent 34). Respondent 41 added “It comes down to what you look like when you come through the door. You have to look like you can do the job.” Respondents recognize the appearance of uniforms as a standard. For example, fire turnout gear, is not necessarily expected to be clean. Instead, limited wear and tear



(within reason) indicates operational experience and helps to justify the decision of managers to interact with that agency.

#### **9.4.2 Customer Service**

“Good customer service, that’s what we’re looking for” (Respondent 41). This comment indicates that certain standards of customer service are important to agencies, particularly EMS agencies (two EMS directors). EMS agencies interact with patients (customers) on a daily basis. How patients perceive agencies, whether they are comfortable with the care provided by personnel, weighs on the decisions of directors to request agencies for mutual aid. If an agency does not demonstrate a suitable level of customer service, others are less likely to request their assistance. Respondent 41 outlined several indicators that focus on how paramedics interact with patients:

Certainly the care and the compassion that they show... If we think it’s all about saving somebody’s life, it’s not. It’s also about how you put a towel around somebody’s head in the middle of winter so you can take grandma outside and she doesn’t get cold. We call it the ‘South Hills babushka.’ How we handle people. How we talk to people. How we take their hand. That’s what they are going to tell. The medication that we are putting in their names, we could be totally wrong. They wouldn’t know the difference. But they know if we handle them roughly. They know how we managed their pain. Pain is one of those things... It doesn’t matter what kind of care that you are giving them, if they don’t entrust their faith in you, they won’t feel like you’re giving them a good service.

The recognition of adequate customer service may be prompted by formal complaints by patients, observation during an incident, or informal feedback. Respondent 40 suggests that the ways agencies measure customer service is more anecdotal than empirical. “We haven’t really followed up with any patient surveys. We have talked about it in implementing a customer service policy. We just haven’t had time to expound on it.”

### **9.4.3 Effort**

Extant literature suggests that actors are less likely to cooperate if they suspect potential partners of free riding (Olson 1965) or cost minimizing (Bardach 1998). With respect to mutual aid agencies, specifically fire, identify consistent effort as a positive factor (four fire chiefs). On the one hand, some respondents have minimal expectations for effort, particularly volunteer agencies. A fire chief, Respondent 12, offered an example of these low expectations. “It’s a volunteer organization. You get what you get.” However, few agencies (paid and unpaid) will continue to work with others who are “dogging it” or “not putting in fair share.” Generally, however, examples of poor effort are not commonly cited. “I can’t think of a time when I thought a company was honestly just dogging it... There are times when there were calls when I thought staffing of a mutual aid company wasn’t enough... but they were not dogging it,” (Respondent 12).

### **9.4.4 Equipment**

The appearance and working order of equipment represent another cited standard of professional performance (three fire chiefs and two EMS directors). Respondent 34, an EMS director, explained how he inspects apparatus and how he draws conclusions about a mutual aid partner. “When they opened the door of their ambulance, does it open or does it only partially open? Look at the truck... is it filthy? The equipment appears to be in disrepair. You kind of hesitate to bring them in to take care of your residents because you want to maintain a good standard of care for them.” (Respondent 34). On the other hand, well-maintained equipment in working order provides justification for decisions makers to decide to cooperate.

#### **9.4.5 Experience and Training**

Several respondents indicated a considerable degree of comfort with agencies with which they train on a regular basis or who have demonstrated experience (six fire chiefs and one police chief). They also indicated more of a willingness to request those agencies over others during response operations. Outside of one-on-one training, respondents recognize who trains and who does not. Informal patterns of information exchange often inform chiefs regarding who participates in various drills, classes, or exercises. One emergency manager, Respondent 44, laid out the choice faced by first responders: “There are other [agencies] out there who will do class after class... And then there are other departments that don’t bother... Now, who’d you rather work with?” On the other hand, agencies without proper training or experience may prompt other agencies to avoid working with them. “There are fire departments that we don’t like to work with because we don’t feel like they train adequately,” Respondent 8 admitted.

#### **9.4.6 Leadership**

Four respondents (three police chiefs and one EMS director) identified the need for “proper supervision” and the openness of chiefs to coordinate during critical incidents as standards of professional performance that influence their decisions to cooperate with other agencies. Police, in particular, are cautious of participating under the command of other departments whose leadership may be problematic. In situations in which tactical decisions are questionable, “the last thing we do is that we say okay we’re out of here. You don’t want to do that. That’s our last option,” Respondent 21, a police chief, indicated.

Respondent 9 identified a situation in which another chief refused to coordinate. “We had an incident where another chief just took his guys and went [into a burning apartment]. He just walked past us... He didn’t know what the conditions were or whether we were doing fire suppression or rescuing people. He just walked right in.” This type of behavior indicates an unwillingness to coordinate and inhibits future cooperation.

#### **9.4.7 Performance**

The ability to complete basic tasks related to the discipline and perform to expectations is a critical standard that influences the decision to cooperate according to four fire chiefs, three police chiefs, one EMS director, and one county official. If an agency cannot do the job, they are less likely to be asked to mutual aid. Several respondents identified poor performance as justification for the discontinuation of cooperative relationships. “It’s been poor care,” Respondent 41 said. “It’s literally the medic didn’t do the right thing. Or just didn’t treat the patient correctly.” Respondent 8 identified a basic competency in the fire discipline as a standard, hitting the hydrant. “We were on a call a couple of months ago where one crew could not even hit the hydrant. You have four guys try to hook up to a hydrant. In our department, day one, it’s the first thing that we trained eyes on. How to hit the hydrant.”

Agencies have removed cooperative partners from their run cards for not demonstrating basic standards of professional performance. “The reason was a lack of showing up with qualified people. It’s not like it was just one single incident where I got ticked off and said I don’t want to have these guys on anymore. It happened several times,” (Respondent 1).

#### **9.4.8 Proper Protocols and Terminology**

Appearance of personnel and equipment demonstrate certain standards as does performance during an incident. How an agency looks and what an agency does indicate basic competence. So too does how personnel in an agency communicate. “You can tell the professionalism of a department on how they handle themselves on the radio. You hear these departments talking on the radio and they can’t put two syllables together” (Respondent 8). Five police chiefs, two EMS directors, and one fire chief cited professionalism and the use of proper terminology on the radio as a key standard.

#### **9.4.9 Response Time**

The ability of first responders to quickly muster personnel and equipment and arrive on a scene is widely recognized as a key standard of professional performance and one that is measurable. While adjacency is positively correlated with faster response times, some agencies are able to muster and arrive faster from farther distances. Whether police, fire, or EMS, response times matter. Seconds and minutes can make the difference between adequately managing an incident and losing control. Patients depend on quick response from emergency medical services. “When there are long response times, these EMS service chiefs hear about it,” Respondent 38 emphasized.

#### 9.4.10 Staffing Levels

Chapter 7 outlines the need for manpower during response operations. The ability to staff an adequate crew in the fire discipline specifically is a recognized standard of performance that influences decision makers according to nine fire chiefs, nine police chiefs, and one EMS director. Table 47 shows that 64.29 percent of police chiefs and 50.00 percent of fire chiefs identify staffing levels as a key standard.

**Table 47: Frequency Distribution of Respondents Identifying Staffing Levels by Discipline**

<b>Discipline</b>	<b># Identifying Concept</b>	<b>Total # of Respondents</b>	<b>% Total</b>
Fire	9	18	50.00
Police	9	14	64.29
EMS	1	13	7.69
Emergency Mgmt	0	13	0
Other	0	5	0
<i>Total</i>	19	63	30.16

Operational success often depends on adequate levels of staffing. “On the volunteer [fire] side, there’s instability in their personnel and maybe you can’t predict the quality of their personnel from one call to the next,” Respondent 24, a police chief, explained. Respondent 9 explained why the inability to staff an adequate crew prevents him from working with certain agencies. “It’s just they couldn’t give what we were looking for. It was nothing personal. I needed fire fighters.” However, the inability to field crews does not permanently inhibit cooperation. “Many of our mutual aid partners are top notch departments. I would put them up against some of the best volunteer fire departments in the country. But you still never know

what you are going to get [in terms of manpower] on any given time of day” (Respondent 12). “Everybody is very light on manpower on daylight,” Respondent 16 acknowledged. “If a company can’t crew, I don’t take it personally because tomorrow it could be me.”

## **9.5 CONCLUSION**

This chapter identifies the key components of administrative structure and process as identified during the semi-structured interviews. Urgent need and close proximity drives the decision of managers to cooperate, specifically at the municipal and county levels. However, examples of agencies in close proximity failing to cooperate exist. Personality conflicts, as outlined in Chapter 8, is one explanation, but another is professional capital. Professional capital represents the standards of professional performance that demonstrate competence and justify the decisions of managers to interact. Professional capital transcends the political and disciplinary boundaries. It provides a set of norms based on practice that facilitates the integration of the system.

## 10.0 FINDINGS AND IMPLICATIONS

I present a polycentric system of governance within a set of public, nonprofit, and for-profit agencies operating in the policy domain of emergency management. Using a complex adaptive systems framework (Axelrod and Cohen 1999), I identify among agencies their patterns of variation, interaction, and the choices that determine whether agencies work together. Decision makers depend on available information to formulate strategies for action. Available information is a product of various knowledge systems that are created and maintained by communication and interaction with other agencies. Variation among agencies leads to disparate strategies for action.

Interaction facilitates the identification of common cause and opportunities for joint action. It also creates a larger knowledge commons (Hess and Ostrom 2007) that facilitates situational awareness and a common operating picture. The policy decision to cooperate is constrained by and shaped by elements of both structure and process. Urgent need, proximity, and professional capital heavily influence when and how decision makers choose to cooperate. Collective action, facilitated by the choices of managers, represents the building blocks for polycentric systems of governance, ranging in levels of intensity and commitment from brief interactions to operationally consolidated groups who plan, train, and respond together while retaining separate administrative structures and organizational identities.



## **10.1 MAJOR RESEARCH FINDINGS**

### **10.1.1 Variation**

Emergency management is a multi-organizational system characterized by a nested set of actors. The present study identifies agencies on the federal, state, regional, and local levels. A critical challenge to these emergency management agencies is creating and maintaining the ability to manage effectively both the daily activities of public safety operations and the demands generated by extreme events. This balancing act is exacerbated by the varying demands of the external environment such as exposure to risk and the vulnerability of the various socio-economic, built, and geophysical systems.

The composition of the system in terms of agencies, activities, strategies for action, and the demands of the external environment provides the field study area with considerable variation. Variability in terms of emergency management agencies' roles, responsibilities, and internal capacities as well as the differing levels of urgency and stress experienced during operations lead to information asymmetry, which inhibits cooperation and coordination across agencies.

### **10.1.2 Interaction**

The present study identifies the types of cooperative activities that occur in the field study area, the levels of integration achieved, and the architecture of the network. I argue that cooperative activities are the building blocks for polycentric systems of governance. I present a model of an

integrated, interdependent system of emergency management, as opposed to the established sequential cycle of disaster response.

#### **10.1.2.1 Types of Cooperative Activities and the Levels of Integration Achieved**

The present study describes cooperative activities as the building blocks for operational and administrative systems. It presents a model of an integrated, interdependent system of emergency management. Analysis of the semi-structured interviews identifies risk assessment, mitigation, preparedness, response, recovery, evaluation and corrective action, and administrative activities as core systemic functions. Each cooperative activity varies in terms of required time, resources, manpower, and information sharing. Analysis confirms that information exchange (through multiple channels) and creation of common bases of knowledge facilitate these activities. All of these activities are pursued by both formal and informal strategies for action and range in intensity of linkages, which supports Cigler's (1999) notion of a continuum of interorganizational cooperation.

The levels of integration in terms of agencies and agency types vary according to the activity. Patterns of interaction range from dense to sparse. The extent to which integration occurs affects system performance as different knowledge and resources are brought to bear in certain contexts and expectations for performance are established.

The present study demonstrates that activities interrelate to form 1.) systems based on single cooperative activities, 2.) interdependent activities that create subsystems, and 3.) an overall emergency management system. The action arena in the present study (Allegheny County) is also a building block of regional, state, and national systems. The recognition of scale in Chapter 5 acknowledges the variation of both organizations and functions, but also the

interaction that takes place as actors select their strategies for action based on available information.

#### **10.1.2.2 The Architecture of a Response Network**

Analysis determines that the emergency management network displays both scale-free and small-world model effects. The dense clustering and short mean distances demonstrated by the field study area (inherent to the small-world model) reveal a neighborhood-centered network for emergency management and public safety. In addition, the scale-free nature of the field study area indicates that there are several highly connected, prominent agencies that span jurisdictional and disciplinary boundaries. These boundary spanners (county agencies, regional EMS agencies, and large municipal police departments) weave the regionally-based, neighborhood-centered clusters of interactions into the larger emergency management system. In all, findings depict a dense network with a robust capacity for information exchange necessary for the detection and response to risk.

#### **10.1.3 Selection**

The present study identifies several factors that influence the policy decision of agencies to engage in collective action. Analysis identified elements of both administrative structure and process. In particular, urgent need, proximity, and professional capital, a concept developed in this dissertation, promote and sustain collective action. The present study offers an initial description of professional capital to describe how recognized standards of professional performance demonstrate competence and justify the decisions of managers to interact. Elements of professional capital, as identified in the semi-structured interviews, include the

condition of equipment, the appearance of the personnel, the ability of personnel to work together effectively, and operational experience. Professional capital transcends disciplinary boundaries, influencing the confidence of decision makers and shaping judgments based on expectations of performance. This concept adds a missing component to social capital theory, which currently focuses on the roles of pre-established trust and reciprocity in promoting collective action.

Influential actors and the rules they generate from throughout the nested set of actors influence collective action. Particularly, state statutes that grant immunity from liability during mutual aid are recognized throughout the field study area. It is a major factor promoting cooperation. The law eliminates the information and other costs of negotiating and drafting mutual aid agreements. In order to establish mutual aid agreement previously municipalities had to sign documents, so there were costs in terms of information, time, and financial resources. This state legislation limits these costs in terms of time, resources, and money.

Information flow and feedback is critical to create a common operating picture in which agencies recognize risk and opportunities to interact. The present study identifies “multiple hatters” as actors that increase information exchange across organizational boundaries. Similar to the notion of bridging social capital (Putnam 2000), they informally link organizations and personnel. They recognize opportunities to exchange information and therefore significantly reduce information costs during the coordination of any joint action.

## 10.2 POLICY RECOMMENDATIONS

The promotion of information exchange, the introduction of positive incentives to cooperate, and the increase in the number of opportunities to interact all promote interorganizational cooperation. The following policy recommendations represent steps based on the present study's findings that agencies can take to increase the extent to which collective action occurs. First, agencies can develop and improve their professional capital through training, education, and experience. Second, the information infrastructure, both informal and formal, can be enhanced to more effectively communicate levels of professional capital and other relevant information throughout the system. Third, the mandates and imperatives of key actors within the field study area can be expanded to facilitate more effective preparedness and response activities across jurisdictional boundaries. In all, increased training and access to this information infrastructure will increase professional capital and the likelihood for collective action.

### 10.2.1 Database of Real-time Threats and Available Resources

Once professional capital is strong, agencies should be able to communicate their competence across jurisdictional boundaries in order to create a more robust, resilient system. The present study focuses on the role of valid, relevant information during decision making in both normal and uncertain conditions. It identifies several areas in which information asymmetry occurs.<sup>34</sup> Examples include an uneven awareness of available resources and potential threats throughout

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<sup>34</sup> Information asymmetry occurs when certain actors possess more pertinent information than others (Comfort 2007).

the system. Information technology provides platforms to eliminate (or reduce) existing information asymmetries, communicate professional capital, and improve system performance. Region 13 and County Emergency Services are in a position to create and maintain an interoperable database of real-time threats and available resources accessible at all levels of government. Region 13 and County Emergency Services currently maintain a resource management platform known as the “Knowledge Center.” However, its ability to communicate real-time threat data is limited. The semi-structured interviews reveal that the vast majority of municipal-level agencies are unaware that Knowledge Center is available for their use.

Providing relevant information such as equipment and service lists provides for more efficient resource management during preparedness, response, and administrative activities. Real-time data on threats (flood levels, etc.) empower decision makers to make more effective decisions about mitigation, preparedness, and response activities. With respect to response operations, personnel in the field study area depend on County 9-1-1 for information. In large-scale incidents, the capacity of County 9-1-1 (and County Emergency Services) to field requests for manpower and other resources may be limited. Understanding who to call, for what resources, and when, are critical pieces of information during “communication on the fly” (Respondent 56). An accessible database listing available resources and personnel would support effective response operations and guard against any potential malfunction at the County 9-1-1 level. It also demonstrates professional capital across jurisdictional boundaries and justifies the decisions of managers to work together.

Outside of response activities, departments rely on word of mouth information regarding threats, vulnerabilities, available equipment, facilities, and training status. Relevant information

would facilitate (potentially) the self-organization of collective action on several activities and help to expand the currently area-bound clusters of interactions.

### **10.2.2 Social Networking Site to Promote Interaction, System Awareness**

The present study demonstrates the role of existing relationships in facilitating interorganizational cooperation. These relationships, however, are generally centered on spatial proximity (by geographic location) and conceptual proximity (by discipline). Agencies at the federal or state levels can bridge these “neighborhood-centered” clusters of interaction by creating and maintaining a social networking site for emergency managers. Findings reveal that increased familiarity and trust among agencies increase the likelihood for cooperation. Information technology, like the social networking platforms Twitter and Facebook, can be used to share information quickly and inexpensively, while creating new relationships and reinforcing existing ones.<sup>35</sup> The intelligence functions of emergency management (i.e. the gathering, analyzing, and distributing of relevant information) can be more effectively and efficiently facilitated through this type of information technology.

The Office of the Director of National Intelligence recently created “A-Space” (Analytic Space), a social-networking site for intelligence analysts, to more effectively connect analysts from the disparate agencies of our intelligence community. A similar application for emergency managers at all levels of government would facilitate information search, exchange, and networking. The types of self-organization facilitated by such information technology range

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<sup>35</sup> Undoubtedly, new platforms will improve the existing capacity of Twitter and Facebook to network and share information.

from administrative activities to quick and efficient personnel searches during an extreme event. For example, the platform would communicate professional capital and allow agencies to coordinate continuing education and training initiatives without direction (and resources) from central authorities.

The social networking site should also influence low-professional capital agencies in a positive way. These agencies potentially have the most to gain from participating in joint activities, but are the least likely to recognize the need. A social networking site not only reduces information costs in terms of identifying opportunities to work together, but it also can communicate examples of high professional capital, i.e. documentation of previous training and past performance as well as current equipment status. The recognition of these various standards of professional performance may motivate low-professional capital agencies to adopt smart practices and become a more engaged player within the emergency management system.

### **10.2.3 Invest in Hardware to Access Data**

The present study recommends that federal, state, and municipal governments increase access to information through the adoption of information technology and compatible hardware. Leaders should work to create environments where information can easily be shared, relationships can be built as well as reinforced, and mindsets focused on turf protection can be changed. The adoption of information technology can significantly increase information search and exchange and transform organizational operations. Miller and Page (2007) find that as opportunities for people to obtain information increases so will their ability to learn quickly and their willingness to share information throughout their system. Increasing the points of access for information, i.e. introducing information technology available both in administrative and operational settings, will



help to challenge existing norms and patterns of interaction. Mobile data terminals, specifically, are rare for personnel in the field study area. In order to take advantage of computer added dispatch (CAD) and any new information technology platforms, personnel must have access to the hardware—whether they are mobile data terminals, iPhones, etc.—to access available information.

#### **10.2.4 Gap Analysis**

State and county agencies can conduct semi-regular gap analyses with municipal-level agencies to identify threats, build a common operating picture, and promote collective action. Municipalities within the field study area are mandated by state statute to draft and submit emergency operational plans to county and state agencies. However, there is little feedback from those agencies per the plans. Emergency management personnel engage in gap analyses at varying rates, most frequently informal analyses. Personnel conduct gap analyses by comparing an agency’s existing plans and resources with scenarios based on potential hazards. Any needs not accounted for in their preplans are the “gaps” (Respondent 25). The identification of these gaps allows for adjustment prior to an extreme event.

#### **10.2.5 Additional Resources and Personnel for Preparedness Activities**

Policies and appropriations can increase the extent to which FEMA, state, and regional/county governments conduct multi-organizational training and simulation exercises, including large-scale exercises and small-scale table top simulations. More opportunities to interact as well as specific threat-focused simulation exercises would increase the extent to which agencies

cooperate. More resources and attention can be directed toward low-professional capital agencies to improve and integrate the system by prompting their participation. These exercises along with individual-level training increase professional capital across agencies. At these events, relationships are created and strengthened and specific threats and vulnerabilities are recognized by creating a common operation picture. FEMA hazard mitigation programs and the new National Exercise Simulation Center offer examples of opportunities to coordinate activities among emergency management agencies.

Regional, county, and municipal governments are in a position to increase opportunities for both formal and informal interactions among system personnel. Increased familiarity and trust among agencies coupled with the demonstration of professional capital increase the likelihood for interorganizational cooperation. The creation of either formal associations or informal working groups facilitated by champions of cooperation at various levels can help to foster future interaction.

### **10.2.6 Cooperation as Precondition for More Federal and State Grants**

Currently, federal and state government grants for public safety and emergency management do not leverage their largess of appropriations to promote interorganizational cooperation. Federal and state grant programs ought to increase the extent to which grants are tied to cooperation. Findings reveal that the realization of benefits, like grant money, motivate interorganizational cooperation. However, most grant opportunities do not require collective action.

Increasing grant allocations to incentivize interorganizational cooperation is possible by amending existing state and federal programs, specifically in state equipment allocation programs and the following DHS and FEMA initiatives: FEMA's Assistance to Firefighters

Grants (AFG), Staffing for Adequate Fire and Emergency Response Grants (SAFER), and Fire Prevention and Safety Grants (FP&S); the Emergency Management Performance Grant (EMPG), the Homeland Security Grant Program (HSGP); the Commercial Equipment Direct Assistance Program (CEDAP); the Competitive Training Grants Program (CTGP); the Nonprofit Security Grant Program (NSGP); the Transit Security Grant Program (TSGP); and the Pre-Disaster Mitigation (PDM) program.

### **10.2.7 Regional Administrative Structures to Facilitate Cooperation**

Regional administrative structures (councils of governments, chiefs associations, etc.) facilitate various types of interorganizational cooperation. In the field study area, one council of government, in particular, provides the staff and expertise to coordinate both an operational forum for collective action and opportunities for administrative cooperation (joint purchasing, coordinated purchasing, etc.). Third parties, such as this COG, help to overcome the transaction costs that come with negotiating and administering multiparty agreements. State financial support for these third parties would enable more of a focus on creating regional public safety and emergency management forums to promote interorganizational cooperation.

### **10.2.8 Expand the Imperative, Mandate, and Resources of Key Agencies**

Within the field study area, the present study identifies two county-level agencies—the county police and fire marshal—that interact with a large number of agencies across jurisdictions and sectors. These two organizations currently are constrained with respect to their interactions with others based on the legal roles, their mandates, and their resources. While the current focus is on

identifying the cause of structure fires and general law enforcement support, these agencies could do more to organize the county's emergency management system if they were more integrated into the county emergency service's mission and mandate. Due to their relatively frequent interaction with municipal-level agencies, they are in a unique position to organize training and support operations during an incident. County-level direction from elected officials and the assignment of personnel as liaison officers across organizations may facilitate this coordinating role.

### **10.2.9 Incorporate the Metropolitan Center More Fully into the System**

Chapters 5 and 6 identify the City of Pittsburgh as a relatively inactive partner within the field study area's response system. A commitment from the City of Pittsburgh to engage in more response and preparedness would go far in filling in the hole that currently exists in the metropolitan center of the network. The system would almost certainly increase its level of resilience by incorporating this influential entity that is currently not as engaged as it could be.

## **10.3 THEORETICAL QUESTIONS AND FUTURE RESEARCH**

### **10.3.1 Expand the Sample Size to Increase Variance and Pursue External Validity**

A limitation of the present study is that while it includes hundreds of organizations it does so in a field study area of only one county. This limitation raises variance questions, particularly the present study's ability to explore the effects of different sets of laws and rules on inter-

organizational cooperation as well as the effects of varying contexts, i.e. biophysical environments and political cultures.

While the present study's thorough investigation of one county is a contribution to the field, an expanded study of multiple MSAs will offer a more valid set of observations to account for the effects of multiple state and county ordinances as well as the effects of multiple political cultures, biophysical attributes like social, built, and natural systems, and the role of political fragmentation. Also, an expanded study will likely show that larger emergency management systems demonstrate scale-free tendencies.

### **10.3.2 Statistically Explore Relationships between Cooperation and Factors**

With the exception of the ANOVA models in Chapter 7, the present study focuses on exploration as opposed to explanation. The use of multivariate statistical methods to determine correlation between measures of interorganizational cooperation and other factors will test the propositions identified by the present study. Gazley, Brudney, and Schneck (2009) regress vulnerability measures against county-level emergency management preparedness and planning variables. Carr and LeRoux (2005) regress public safety service agreement measures against various municipal characteristics. A future study would expand on the present study's work by modeling the effects of variables such as trust, respect, and professional capital as well as institutional variables such as proximity and need.

Statistically with an "N" of one it is difficult to pursue causation. The present study does not employ a causal design. Instead, it offers an exploratory design intended to provide propositions for future research. With new propositions for causal inferences, the improved availability of data across metropolitan statistical areas (MSAs) will facilitate other research

methods more appropriate for investigating correlations between cooperation variables and other factors.

Another limitation is the age of the data used (U.S. Census, 2000; DCED, 2006; 9-1-1 data, 2007). The present study deals with rapidly evolving systems, including changing technical systems. Upgrades in communication equipment and other pieces of information technology potentially have the effect of changing existing patterns of interaction. Disciplined survey work will serve an important role in validating the findings from the present study and will achieve a higher standard of reliability.

### **10.3.3 Explore the Role of Time**

Short, medium, and long-term temporal analysis of the field study area will provide several implications regarding the influence of time on cooperation. First, a temporal analysis of the existing network data will determine if the network architecture changes by week and by month. It will identify specific agencies and types of agencies that perform at varying rates based on time of year. Second, a comparison of 2008 and 2009 data will identify any statistical impact that Act 93 and the Statewide Municipal Police Jurisdiction Act immediately had on interorganizational cooperation.<sup>36</sup> Third, an investigation of the same field study area in five years will help map the rate of change and identify the factors that determine change in emergency management networks. It will investigate the role of information technology and the effect of increased information sharing on the evolution of the network.

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<sup>36</sup> The two pieces of legislation grant fire and police departments immunity from liability if they are requested by home agencies.

#### **10.3.4 Simulation Modeling**

Another area for future research is agent-based simulation modeling. Modeling complex adaptive systems will help to identify critical relationships and processes that affect performance. Agent-based models are an appropriate framework (Miller and Page 2007). “A major part of the modeling effort for any (complex adaptive system)... goes into selecting and representing stimuli and responses, because the behaviors and strategies of the component agents are determined thereby” (Holland 1995, p. 8). The present study will identify appropriate stimuli and responses as identified by the domain experts (the presence of critical information, rules that affect information exchange, etc). Using simulation modeling (Gilbert and Troitzsch 1999) to explore systemic effects of policy interventions such as the introduction of information technology will offer empirical implications for managing emergency management networks and increasing the rate of cooperation.

## APPENDIX A

### INTER-ORGANIZATIONAL COOPERATION

Clayton Wukich  
Interview Protocol  
6-2-10

#### Introduction

1. What's the mission of your agency?
2. With what agencies does your agency work?

#### Factors that Promote

3. What factors facilitate your agency working with other agencies?
  - a. What are the benefits of cooperation?
  - b. What factors help your agency keep these partnerships going?

#### Factors that Inhibit

4. What obstacles/barriers keep your agency from cooperating with other agencies?
  - a. What are the costs of working with other agencies?
  - b. What kind of problems have you encountered in trying to keep partnerships going?
5. Has your agency ever been in a situation where another agency didn't contribute their fair share? Did this discourage your organization from working with that agency and other agencies?



6. When your agency works with another agency, how does it assess the value of the partnership? Does this assessment affect whether your agency will cooperate with that agency in the future?

#### Factors that either Promote or Inhibit

7. What laws, rules, and policies affect whether you cooperate? How so?
8. What are the incentives for personnel in your agency to work with other agencies?
9. What do personnel in your agencies think about working with other agencies?
  - a. What gains do they expect from working with other agencies?
  - b. What costs do they expect from working with other agencies?
10. What professional standards of performance does your agency expect while working with other agencies?
11. When your agency extends mutual aid, how confident is your agency that the other agency will reciprocate?
12. What in your judgment is the role of leadership in initiating and maintaining cooperative relationships?

#### Decision Making

13. Who (what external actor or agency) influences your agency's decision to cooperate or not cooperate? How so?
14. What criteria do your agency use in deciding with what agencies to interact and what agencies to avoid?
  - a. Do those criteria change under conditions of stress? If so, why?
  - b. Do those criteria change overtime in normal conditions?

### Information Search and Exchange

15. What means does your agency use to communicate with personnel from other agencies?
  - a. How does your agency determine who to contact and under what conditions?
  - b. Are there formal and informal ways to communicate? Please explain.
  - c. How often does your agency communicate with other agencies?
  
16. What kinds of information are important to your agency while working with other agencies?
  - a. Where do you get information from?
  - b. How do you manage (store and update) your information?
  
17. What types of information do you share with other agencies? Under what conditions does your agency share that information?

### Networks

18. Which agencies are the most important to your agency's operations?
  - a. How did your agency develop relationships with personnel from those agencies?
  - b. What are the most effective ways to maintain and extend those relationships?
  - c. What factors inhibit those relationships?
  - d. How does your agency expand your network to include new people from other agencies?
  
19. What memberships in professional associations or informal relationships influence whether your agency works together with others?

### Conclusion

20. What is your general position with your agency?
  
21. Please estimate your years of experience with your agency.  
0-5 yrs \_\_\_\_ 6-10 yrs \_\_\_\_ 11-15 yrs \_\_\_\_ 16-20 yrs \_\_\_\_ 21-25 yrs \_\_\_\_ > 25 yrs
  
22. Please estimate your years of experience in your discipline.  
0-5 yrs \_\_\_\_ 6-10 yrs \_\_\_\_ 11-15 yrs \_\_\_\_ 16-20 yrs \_\_\_\_ 21-25 yrs \_\_\_\_ > 25 yrs

23. What are your agency's major sources of funding?

24. What is your level of educational achievement?

25. What is the level of training that you have completed for your discipline?

26. Is there anything that you would like add?

## APPENDIX B

### SURVEY DEFINITION

<i>Cooperative Activity</i>	<i>Definition</i>
<b>Risk Assessment</b>	Any joint activity related to the identification of hazards, the monitoring of those hazards, the likelihood of their occurrence, and the identification of the vulnerability of people, property, the environment, and your agency to those hazards.
<b>Incident Prevention/Mitigation</b>	Measures taken to reduce vulnerability, i.e. limit or control the consequences, extent, or severity of an incident that cannot be reasonably prevented. And activities or strategies to prevent an incident that threatens people, property, and the environment.
<b>Planning</b>	Any joint-planning regarding potential activities during the mitigation, preparedness, response, or recovery phases of disaster management.
<b>Resource Management</b>	Development of procedures with other agencies to locate, acquire, store, distribute, maintain, test, and account for services, personnel, resources, materials, and facilities.
<b>Developing an Incident Management System</b>	Joint activities to develop an incident management system to direct, control, and coordinate response and recovery operations, i.e. ICS.
<b>Developing Operations and Procedures to Support Programs and Execute Plans</b>	Activities to develop, coordinate, and/or implement operational procedures to support the program and execute plans.
<b>Communication and Warning System Testing and/or Use</b>	Joint testing or use of communication equipment and warning systems.
<b>Training</b>	Training, exercise-related, and/or educational activities
<b>Response (Mutual Aid Received/Rendered)</b>	Joint response to emergency incidents with outside agencies.
<b>Recovery Efforts</b>	Joint recovery efforts with outside agencies to restore and rebuild communities.

<b>Evaluation and Corrective Actions</b>	Evaluation and/or post-incident analysis of program plans, procedures, capabilities, and performance
<b>Finance and Administration</b>	Activities related to joint purchasing, accounting, etc.
<b>Grant and Financial Aid Applications</b>	Any request for external funding or consideration of giving.
<b>Equipment/Resource Sharing</b>	Any lending or borrowing of equipment and resources with other agencies for actual use.
<b>Community Events</b>	Events such as parades, fish fries, festivals, etc.
<b>Others?</b>	<u>Fire</u> : Inspection, Investigations, Public Education (Fire Safety), Fire Hydrant Maintenance, etc. <u>Police</u> : Officer Training, Patrol, Detectives/Crime Investigations, Canine Unit, Crime Laboratory

\* Survey modified from the NFPA 1600 "Standard on Disaster/Emergency Management and Business Continuity Programs" 2007 Edition

## APPENDIX C

### SURVEY: EMERGENCY MANAGEMENT COOPERATION INDEX

To what extent does your agency work with other agencies on the following activities?		Never	Every other year	Once a year	Twice a year	Three times a year	Monthly	Weekly	Daily
<i>Please circle the most appropriate answer</i>									
<p style="text-align: center;"><b>Risk Assessment</b></p> <p>Any activity related to the identification of hazards, the monitoring of those hazards, the likelihood of their occurrence, and the identification of the vulnerability of people, property, the environment, and your agency to those hazards.</p>	In general	1	2	3	4	5	6	7	8
	With agencies inside of your jurisdiction	1	2	3	4	5	6	7	8
	With agencies outside of your jurisdiction	1	2	3	4	5	6	7	8
	With agencies within your discipline	1	2	3	4	5	6	7	8
	With agencies outside of your discipline	1	2	3	4	5	6	7	8
	With municipal agencies	1	2	3	4	5	6	7	8
	With county agencies	1	2	3	4	5	6	7	8
	With regional agencies	1	2	3	4	5	6	7	8
	With state agencies	1	2	3	4	5	6	7	8
	With federal agencies	1	2	3	4	5	6	7	8
<p style="text-align: center;"><b>Mitigation/Incident Prevention</b></p> <p>Activities or strategies to prevent an incident that threatens people, property, and the environment. And measures taken to reduce vulnerability, i.e. limit or control the consequences, extent, or severity of an incident that cannot be reasonably prevented.</p>	In general	1	2	3	4	5	6	7	8
	With agencies inside of your jurisdiction	1	2	3	4	5	6	7	8
	With agencies outside of your jurisdiction	1	2	3	4	5	6	7	8
	With agencies within your discipline	1	2	3	4	5	6	7	8
	With agencies outside of your discipline	1	2	3	4	5	6	7	8
	With municipal agencies	1	2	3	4	5	6	7	8
	With county agencies	1	2	3	4	5	6	7	8
	With regional agencies	1	2	3	4	5	6	7	8
	With state agencies	1	2	3	4	5	6	7	8
	With federal agencies	1	2	3	4	5	6	7	8

<p style="text-align: center;"><b>Planning</b></p> <p>Any joint-planning activities regarding the mitigation, preparedness, response, or recovery phases of disaster management.</p>	In general	1	2	3	4	5	6	7	8
	With agencies inside of your jurisdiction	1	2	3	4	5	6	7	8
	With agencies outside of your jurisdiction	1	2	3	4	5	6	7	8
	With agencies within your discipline	1	2	3	4	5	6	7	8
	With agencies outside of your discipline	1	2	3	4	5	6	7	8
	With municipal agencies	1	2	3	4	5	6	7	8
	With county agencies	1	2	3	4	5	6	7	8
	With regional agencies	1	2	3	4	5	6	7	8
	With state agencies	1	2	3	4	5	6	7	8
	With federal agencies	1	2	3	4	5	6	7	8
<p style="text-align: center;"><b>Resource Management</b></p> <p>Procedures to locate, acquire, store, distribute, maintain, test, and account for services, personnel, resources, materials, and facilities.</p>	In general	1	2	3	4	5	6	7	8
	With agencies inside of your jurisdiction	1	2	3	4	5	6	7	8
	With agencies outside of your jurisdiction	1	2	3	4	5	6	7	8
	With agencies within your discipline	1	2	3	4	5	6	7	8
	With agencies outside of your discipline	1	2	3	4	5	6	7	8
	With municipal agencies	1	2	3	4	5	6	7	8
	With county agencies	1	2	3	4	5	6	7	8
	With regional agencies	1	2	3	4	5	6	7	8
	With state agencies	1	2	3	4	5	6	7	8
	With federal agencies	1	2	3	4	5	6	7	8
<p style="text-align: center;"><b>Incident Management</b></p> <p>Activities to develop an incident management system to direct, control, and coordinate response and recovery operations, i.e. ICS.</p>	In general	1	2	3	4	5	6	7	8
	With agencies inside of your jurisdiction	1	2	3	4	5	6	7	8
	With agencies outside of your jurisdiction	1	2	3	4	5	6	7	8
	With agencies within your discipline	1	2	3	4	5	6	7	8
	With agencies outside of your discipline	1	2	3	4	5	6	7	8
	With municipal agencies	1	2	3	4	5	6	7	8
	With county agencies	1	2	3	4	5	6	7	8
	With regional agencies	1	2	3	4	5	6	7	8
	With state agencies	1	2	3	4	5	6	7	8
	With federal agencies	1	2	3	4	5	6	7	8
<p style="text-align: center;"><b>Operations and Procedures</b></p> <p>Activities to develop, coordinate, and/or implement operational procedures to support the program and execute plans.</p>	In general	1	2	3	4	5	6	7	8
	With agencies inside of your jurisdiction	1	2	3	4	5	6	7	8
	With agencies outside of your jurisdiction	1	2	3	4	5	6	7	8
	With agencies within your discipline	1	2	3	4	5	6	7	8
	With agencies outside of your discipline	1	2	3	4	5	6	7	8
	With municipal agencies	1	2	3	4	5	6	7	8
	With county agencies	1	2	3	4	5	6	7	8
	With regional agencies	1	2	3	4	5	6	7	8
	With state agencies	1	2	3	4	5	6	7	8
	With federal agencies	1	2	3	4	5	6	7	8

<b>Communication and Warning</b> Joint testing or use of communication equipment	In general	1	2	3	4	5	6	7	8
	With agencies inside of your jurisdiction	1	2	3	4	5	6	7	8
	With agencies outside of your jurisdiction	1	2	3	4	5	6	7	8
	With agencies within your discipline	1	2	3	4	5	6	7	8
	With agencies outside of your discipline	1	2	3	4	5	6	7	8
	With municipal agencies	1	2	3	4	5	6	7	8
	With county agencies	1	2	3	4	5	6	7	8
	With regional agencies	1	2	3	4	5	6	7	8
	With state agencies	1	2	3	4	5	6	7	8
	With federal agencies	1	2	3	4	5	6	7	8
<b>Training</b> Training, exercise-related, and/or educational activities	In general	1	2	3	4	5	6	7	8
	With agencies inside of your jurisdiction	1	2	3	4	5	6	7	8
	With agencies outside of your jurisdiction	1	2	3	4	5	6	7	8
	With agencies within your discipline	1	2	3	4	5	6	7	8
	With agencies outside of your discipline	1	2	3	4	5	6	7	8
	With municipal agencies	1	2	3	4	5	6	7	8
	With county agencies	1	2	3	4	5	6	7	8
	With regional agencies	1	2	3	4	5	6	7	8
	With state agencies	1	2	3	4	5	6	7	8
	With federal agencies	1	2	3	4	5	6	7	8
<b>Response</b> <b>Mutual Aid Received/Rendered</b> Joint response to emergency incidents with outside agencies.	In general	1	2	3	4	5	6	7	8
	With agencies inside of your jurisdiction	1	2	3	4	5	6	7	8
	With agencies outside of your jurisdiction	1	2	3	4	5	6	7	8
	With agencies within your discipline	1	2	3	4	5	6	7	8
	With agencies outside of your discipline	1	2	3	4	5	6	7	8
	With municipal agencies	1	2	3	4	5	6	7	8
	With county agencies	1	2	3	4	5	6	7	8
	With regional agencies	1	2	3	4	5	6	7	8
	With state agencies	1	2	3	4	5	6	7	8
	With federal agencies	1	2	3	4	5	6	7	8
<b>Recovery Efforts</b> Joint recovery efforts with outside agencies to restore and rebuild communities.	In general	1	2	3	4	5	6	7	8
	With agencies inside of your jurisdiction	1	2	3	4	5	6	7	8
	With agencies outside of your jurisdiction	1	2	3	4	5	6	7	8
	With agencies within your discipline	1	2	3	4	5	6	7	8
	With agencies outside of your discipline	1	2	3	4	5	6	7	8
	With municipal agencies	1	2	3	4	5	6	7	8
	With county agencies	1	2	3	4	5	6	7	8
	With regional agencies	1	2	3	4	5	6	7	8
	With state agencies	1	2	3	4	5	6	7	8
	With federal agencies	1	2	3	4	5	6	7	8



<b>Evaluation and Corrective Actions</b> Evaluation and/or post-incident analysis of program plans, procedures, capabilities, and performance	In general	1	2	3	4	5	6	7	8
	With agencies inside of your jurisdiction	1	2	3	4	5	6	7	8
	With agencies outside of your jurisdiction	1	2	3	4	5	6	7	8
	With agencies within your discipline	1	2	3	4	5	6	7	8
	With agencies outside of your discipline	1	2	3	4	5	6	7	8
	With municipal agencies	1	2	3	4	5	6	7	8
	With county agencies	1	2	3	4	5	6	7	8
	With regional agencies	1	2	3	4	5	6	7	8
	With state agencies	1	2	3	4	5	6	7	8
With federal agencies	1	2	3	4	5	6	7	8	

<b>Finance and Administration</b> Activities related to joint purchasing, accounting, etc.	In general	1	2	3	4	5	6	7	8
	With agencies inside of your jurisdiction	1	2	3	4	5	6	7	8
	With agencies outside of your jurisdiction	1	2	3	4	5	6	7	8
	With agencies within your discipline	1	2	3	4	5	6	7	8
	With agencies outside of your discipline	1	2	3	4	5	6	7	8
	With municipal agencies	1	2	3	4	5	6	7	8
	With county agencies	1	2	3	4	5	6	7	8
	With regional agencies	1	2	3	4	5	6	7	8
	With state agencies	1	2	3	4	5	6	7	8
With federal agencies	1	2	3	4	5	6	7	8	

<b>Grant and Financial Aid Applications</b> Any request for external funding.	In general	1	2	3	4	5	6	7	8
	With agencies inside of your jurisdiction	1	2	3	4	5	6	7	8
	With agencies outside of your jurisdiction	1	2	3	4	5	6	7	8
	With agencies within your discipline	1	2	3	4	5	6	7	8
	With agencies outside of your discipline	1	2	3	4	5	6	7	8
	With municipal agencies	1	2	3	4	5	6	7	8
	With county agencies	1	2	3	4	5	6	7	8
	With regional agencies	1	2	3	4	5	6	7	8
	With state agencies	1	2	3	4	5	6	7	8
With federal agencies	1	2	3	4	5	6	7	8	

<b>Equipment/Resource Sharing</b> Any lending or borrowing of equipment and/or resources with other agencies	In general	1	2	3	4	5	6	7	8
	With agencies inside of your jurisdiction	1	2	3	4	5	6	7	8
	With agencies outside of your jurisdiction	1	2	3	4	5	6	7	8
	With agencies within your discipline	1	2	3	4	5	6	7	8
	With agencies outside of your discipline	1	2	3	4	5	6	7	8
	With municipal agencies	1	2	3	4	5	6	7	8
	With county agencies	1	2	3	4	5	6	7	8
	With regional agencies	1	2	3	4	5	6	7	8
	With state agencies	1	2	3	4	5	6	7	8
With federal agencies	1	2	3	4	5	6	7	8	

<p align="center"><b>Community Events</b></p> <p>Events such as parades, fish fries, festivals, etc.</p>	In general	1	2	3	4	5	6	7	8
	With agencies inside of your jurisdiction	1	2	3	4	5	6	7	8
	With agencies outside of your jurisdiction	1	2	3	4	5	6	7	8
	With agencies within your discipline	1	2	3	4	5	6	7	8
	With agencies outside of your discipline	1	2	3	4	5	6	7	8
	With municipal agencies	1	2	3	4	5	6	7	8
	With county agencies	1	2	3	4	5	6	7	8
	With regional agencies	1	2	3	4	5	6	7	8
	With state agencies	1	2	3	4	5	6	7	8
With federal agencies	1	2	3	4	5	6	7	8	
<p align="center"><b>Others</b></p> <p>Please specify</p> <p><u>Fire</u>: Inspection, Investigations, Public Education (Fire Safety), Fire Hydrant Maintenance, etc.</p> <p><u>Police</u>: Officer Training, Patrol, Detectives/Crime Investigations, Canine Unit, Crime Laboratory, etc.</p>	In general	1	2	3	4	5	6	7	8
	With agencies inside of your jurisdiction	1	2	3	4	5	6	7	8
	With agencies outside of your jurisdiction	1	2	3	4	5	6	7	8
	With agencies within your discipline	1	2	3	4	5	6	7	8
	With agencies outside of your discipline	1	2	3	4	5	6	7	8
	With municipal agencies	1	2	3	4	5	6	7	8
	With county agencies	1	2	3	4	5	6	7	8
	With regional agencies	1	2	3	4	5	6	7	8
	With state agencies	1	2	3	4	5	6	7	8
With federal agencies	1	2	3	4	5	6	7	8	

\* Survey modified from the NFPA 1600 "Standard on Disaster/Emergency Management and Business Continuity Programs" 2007 Edition

## APPENDIX D

### FIRE DEPARTMENTS IN THE FIELD STUDY AREA

Acronym	Department
alp101f	Aleppo
alv318f	Allegheny Valley
apw102f	Aspinwall
arn345f	Arnold #1
arn346f	Arnold #2
asr324f	Air Search Rescue
avn103f	Avalon
bau259f	Bauerstown (Shaler Twp)
bav109f	Ben Avon
bdk113f	Braddock
bel307f	Big Sewickley Creek (Bell Acres)
bfl375	Buffalo
bfw115f	Bradford Woods
bkh114f	Braddock Hills
bkr106f	Becks Run
bln105f	Baldwin #1
blv108f	Bellevue
bnx111f	Blawnox
bow255f	Bower Hill (Scott Twp)
bpk110f	Bethel Park
brg117f	Bridgeville
bts320f	Bettis
bwd116f	Brentwood
cbg384f	Canonsburg
ccl365f	Cecil Twp. #1
ccl366f	Cecil Twp. #3

cft128f	Crafton
chc122f	Churchill
che260f	Cherry City (Shaler Twp)
chl120f	Chalfant
cln123f	Clairton
clw321f	USS Clairton Works
cng118f	Carnegie
cnt129f	Crescent Twp
coc258f	Cochran Hose (Sewickley)
col124f	Kirwin Heights (Collier Twp)
col125f	Presto (Collier Twp)
col126f	Rennerdale (Collier Twp)
cra364f	Cranberry Twp.
crg348f	Curtiss Wright EMD
crl357f	Carroll Twp.
crl362f	Valley Inn (Carroll Twp)
crp127f	Coraopolis
csh119f	Castle Shannon
cst212f	Crestas Terrace
ctz167f	Citizens Hose #2
cwk121f	Cheswick
dbg131f	Dravosburg #1
dmt130f	Dormont
dnr358f	Donora
duq133f	Duquesne
dxn210f	North Versailles (Dixon)
eca256f	East Carnegie (Scott Twp)
ecm370f	Economy
edr134f	East Deer
EFD	East Fire Dispatch Area
elf261f	Elfinwild (Shaler Twp)
elz142f	Blaine Hill (Elizabeth Twp)
elz143f	Elizabeth Twp. #1
elz144f	Greenock (Elizabeth Twp)
elz145f	Buena Vista (Elizabeth Twp)
elz146f	Victory (Elizabeth Twp)
elz147f	Central (Elizabeth Twp)
elz323f	Elizabeth Twp Disaster
emk135f	United FR (East McKeesport)
ems148f	Emsworth
ept136f	East Pittsburgh

etn149f	Etna
evc391f	Evans City
ewd137f	Edgewood
ewh138f	Edgeworth
ezb139f	Elizabeth Boro
fnl152f	Imperial (Findlay Twp)
fre398f	Freeport
frh153f	Forest Hills
frp158f	Franklin Park
fwd154f	Gallatin-Sunnyside (Forward Twp)
fwd155f	Forward Twp.
fwd156f	Bunola (Forward Twp)
fwn150f	Fawn #1
fwn151f	Fawn #2
fxc157f	Fox Chapel
fzr159f	Frazer #1
fzr160f	Frazer #2
gle257f	Glendale (Scott Twp)
gls161f	Glassport #1
gpa100f	GPIA Fire Dept
gtr163f	Green Tree
har520f	Harrison Twp Fire Police
hbg170f	Heidelberg
hmd171f	Homestead
hmp164f	Hampton
hmp165f	North Hampton (Hampton Twp)
hmr166f	Harmar Twp
hnh169f	Harrison Hills
hrm371f	Harmony
htp168f	Hilltop Hose
igm176f	Ingram
ind172f	Dorseyville (Indiana Twp)
ind173f	Indianola (Indiana Twp)
ind174f	Middle Road (Indiana Twp)
ind175f	Rural Ridge (Indiana Twp)
irv322f	USS Irvin Works
jfh178f	Floreffe (Jefferson Hills)
jfh179f	Gill Hall (Jefferson Hills)
jfh180f	885 Area (Jefferson Hills)
jfr177f	Jefferson Fire Rescue
klb182f	Kilbuck Twp

knd181f	Kennedy Twp
lbu336f	Lower Burrell #1 (Kinloch)
lbu337f	Lower Burrell #2 (Braeburn)
lbu338f	Lower Burrell #3 (Bonnaire)
lbu339f	Lower Burrell #4 (Braeville)
lby183f	Liberty
lcn184f	Lincoln
lee309f	Leetsdale
ltp308f	Fair Oaks (Leet Twp)
mcd186f	Highland (McCandless)
mcd187f	Ingomar (McCandless)
mcd188f	Peebles (McCandless)
mcd310f	McDonald
mdn369f	Madison
mhl200f	Munhall #1
mhl201f	Munhall #2
mhl202f	Munhall #3
mhl203f	Munhall #4
mhl204f	Munhall #5
mid373f	Middlesex
mkp190f	McKeesport
mkr189f	McKees Rocks
mnt197f	Moon Twp
mnv192f	Monroeville #1
mnv193f	Monroeville #3
mnv194f	Monroeville #4
mnv195f	Monroeville #5
mnv196f	Monroeville #6
mon359f	Monongahela
mrs374f	Adams Twp (Mars)
msl185f	Marshall Twp
msn383f	Monessen
mtl198f	Mt. Lebanon
mto199f	Mt. Oliver
mtp379f	Hickory/Mt.Pleasant
mur332f	Murrysville
mur333f	Sardis (Murrysville)
mur334f	White Valley (Murrysville)
mvl191f	Millvale
mwy392f	Midway
myf319f	Mon Yough Fire Defense Council

nbk207f	North Braddock
neg360f	New Eagle
nft209f	North Fayette
nhd331f	Hartford Heights (North Huntingdon)
nhf351f	North Huntingdon Rescue 8
nht349f	Circleville (North Huntingdon Twp)
nhu367f	Larimer (North Huntingdon)
nhu380f	Fairmont Hahntown (North Huntingdon)
nke340f	New Kensington #1
nke341f	New Kensington #2
nke342f	New Kensington #3
nke343f	New Kensington #4
nke344f	New Kensington #5
NOFD	North Fire Dispatch Area
nor313f	Northwest EMS
nst378f	North Strabane
nvl205f	Neville
nvs213f	North Versailles (Sunset-Central)
nvs214f	North Versailles (Green Valley)
ohr217f	Pleasant Valley (O'Hara)
ohr218f	Parkview (O'Hara)
ohr219f	Guyasuta (O'Hara)
oht220f	Ohio Twp
okd215f	Oakdale
okm216f	Oakmont
opt107f	Option
pit231f	Pittsburgh
plu232f	Pleasant Hills
plu233f	Unity #1 (Plum)
plu234f	Renton #2 (Plum)
plu235f	Logans Ferry #3 (Plum)
plu236f	Holiday Park #4 (Plum)
plu395f	Plum Fire Police
pnh221f	Penn Hills #1
pnh222f	Penn Hills #2
pnh223f	Penn Hills #3
pnh224f	Penn Hills #4
pnh225f	Penn Hills #5
pnh226f	Penn Hills #6
pnh227f	Penn Hills #7
pnh516f	Penn Hills Fire Marshal

pnr112f	Pioneer Hose (Brackenridge)
ptc229f	Pitcairn #1
ptc230f	Pitcairn #2
ptr361f	Peters Twp.
ptv237f	Port Vue
ran238f	Rankin
res239f	Mt. Troy (Reserve Twp)
res240f	Spring Garden (Reserve Twp)
ric241f	Richland Twp
ric242f	Valencia (Richland Twp)
rob243f	Forest Grove (Robinson Twp)
rob244f	Groveton (Robinson Twp)
rob245f	Moon Run (Robinson Twp)
ros246f	Evergreen (Ross Twp)
ros247f	Berkeley Hills (Ross Twp)
ros248f	Perrysville (Ross Twp)
ros249f	Quaill (Ross Twp)
ros250f	Fairview (Ross Twp)
ros251f	Seville (Ross Twp)
ros252f	Keathing (Ross Twp)
ros253f	Laurel Gardens (Ross Twp)
ros254f	Ross Twp Fire Police
ros312f	Ross Westview EMS
ros510f	Ross Twp Fire Marshal
rsv350f	Collinsburg (Rostraver Twp)
rsv352f	Webster #1 (Rostraver Twp)
rsv353f	Rostraver Central (Rostraver Twp)
sar376f	Sarver
sax377f	Saxonburg
sbn104f	South Baldwin
sdb273f	Springdale Boro.
sdt274f	Springdale Twp.
sft266f	Cuddy (South Fayette Twp)
sft267f	Sturgeon (South Fayette Twp)
sft268f	Fairview (South Fayette Twp)
sft269f	Oak Ridge (South Fayette Twp)
sha262f	Shaler Village (Shaler Twp)
sha263f	Sharps Hill (Shaler Twp)
sha264f	Undercliff (Shaler Twp)
sha325f	Shaler Fire Police
sha513f	Shaler Fire Police



shb265f	Sharpsburg
SOFD	South Fire Dispatch Area
spt270f	Broughton (South Park Twp)
spt271f	Library (South Park Twp)
stw275f	Flemming Park (Stowe Twp)
stw276f	West Park (Stowe Twp)
stw277f	Presston (Stowe Twp)
sut354f	Sutersville VFD
svt272f	Coulter (South Versailles Twp)
swi278f	Swissvale #1
swi279f	Swissvale V.F.D. #2
swk381f	Herminie (Sewickley Twp)
swk382f	Lowber (Sewickley Twp)
sww368f	Rillton (Sewickley Twp)
tar280f	Highland Hose (Tarentum)
tar281f	Eureka Hose (Tarentum)
tar282f	Summit Hose (Tarentum)
tra311f	Trafford
tur283f	Turtle Creek
ubt335f	Upper Burrell Twp.
uni330f	Elrama (Union Twp)
usc284f	Upper St. Clair
ver285f	Verona
vsl286f	Versailles
wal287f	United FR (Wall)
wde288f	West Deer #1
wde289f	West Deer #2
wde290f	West Deer #3
wdg306f	Wilmerding
wel291f	West Elizabeth
wex228f	Wexford (Pine Twp)
whi298f	Whitaker
whi301f	Whitehall
whs292f	West Homestead
wil302f	Wilkins #1
wil303f	Wilkins #3
wil304f	Wilkins #4
wil305f	Wilkinsburg
wil514f	Wilkins Twp Fire Marshal
wmi293f	Homeville #1 (West Mifflin)
wmi294f	Duquesne Annex #2 (West Mifflin)

wmi295f	West Mifflin #3
wmi296f	Skyview #4 (West Mifflin)
wmi297f	West View
wnw365f	West Newton
woa299f	White Oak #1
woa300f	Rainbow (White Oak)
wsh347f	Washington Twp
wsh363f	Washington Twp.
wvi298f	Whitaker
wwm211f	West Wilmerding
zlp372f	Zelienople

## APPENDIX E

### POLICE DEPARTMENTS IN THE FIELD STUDY AREA

<b>Acronym</b>	<b>Department</b>
asp	Aspinwall
avp	Avalon
baldp	Baldwin Twp
belp	Bellevue
bhp	Braddock Hills
blawp	Blawnox
bpp	Bethel Park
brackp	Brackenridge
bradp	Braddock
brentp	Brentwood
bridgep	Bridgeville
carp	Carnegie/Pennsbury
chesp	Cheswick
chup	Churchill
colp	Collier Twp
cp	Clairton
craftp	Crafton/Thornburg
csp	Castle Shannon
dorp	Dormont
dravp	Dravosburg
duqp	Duquesne
ebp	Elizabeth Boro
edgep	Edgewood
emp	East McKeesport
emsp	Emsworth
epp	East Pittsburgh

etnap	Etna
etp	Elizabeth Twp
fcp	Fox Chapel
forp	Forest Hills
forp	Forward
fpp	Franklin Park
glasp	Glassport
greenp	Greentree
hamp	Hampton
harp	Harmar Twp
heip	Heidelberg
homp	Homestead
htp	Harrison Twp
indp	Indiana Twp
ingp	Ingram
jefp	Jefferson Hills
kenp	Kennedy Twp
kilp	Kilbuck Twp
linp	Lincoln
lp	Liberty
mckp	McKeesport
mcp	McCandless
milp	Millvale
mlp	Mt. Lebanon
moonp	Moon Township
mop	Mt Oliver
mrp	McKees Rocks
munp	Munhall
nbp	North Braddock
nfp	North Fayette
nvp	North Versailles Twp
oakdp	Oakdale
oakmp	Oakmont
ohiop	Ohio Twp
ohp	O'Hara Twp
pghp	Pittsburgh City
php	Penn Hills
php	Pleasant Hills
plump	Plum
pvp	Port Vue
ranp	Rankin

resp	Reserve Twp
richp	Richland Twp
roslynp	Rossllyn Farms
rosp	Ross Twp
sbp	Sharpsburg
scotp	Scott Twp
sewp	Sewickley
sfp	South Fayette
shalp	Shaler Twp
spbp	Springdale Borough
sptp	South Park Twp
sptp	Springdale Township
stowep	Stowe Twp
swisp	Swissvale
tarp	Tarentum
tcp	Turtle Creek
vp	Versailles
vrnp	Verona
wdp	West Deer
whitp	Whitaker
whomp	West Homestead
whp	White Hall
wilp	Wilkins Twp
wmp	West Mifflin
wop	White Oak
wp	Wilkinsburg
wvp	West View

## APPENDIX F

### EMS AGENCIES IN THE FIELD STUDY AREA

<b>Acronym</b>	<b>Agency</b>	<b>Service Type</b>
alq102m	Aspinwall (QRS)	QRS
baq259m	Bauerstown (QRS)	QRS
bhq247m	Berkeley Hills (Ross Twp) (QRS)	QRS
bla192m	Northwest EMS, Bellevue (ALS)	ALS
bnq142m	Blaine Hill (Elizabeth Twp) EMS	ALS
bra530m	Brentwood EMS (ALS)	ALS
bwa510m	Baldwin EMS (ALS)	ALS
cga715m	Carnegie EMS (ALS)	ALS
clq272m	Coulter (QRS)	QRS
cna550m	Clairton EMS (ALS)	ALS
crq128m	Crafton (QRS)	QRS
cwa6900	Canonsburg EMS	ALS
cza110m	Citizens EMS (ALS)	ALS
dqa565m	Duquesne EMS (ALS)	ALS
eea310m	Eastern Area Pre-Hospital Services (ALS)	ALS
ebq139m	Elizabeth Boro EMS	ALS
eda125m	East Deer EMS (ALS)	ALS
etq149m	Etna (QRS)	QRS
eua280m	Eureka EMS (ALS)	ALS
eza520m	Elizabeth Twp Area EMS (ALS)	ALS
fda594m	Forward Twp EMS (ALS)	ALS
fra330m	United Fire Rescue (ALS)	ALS
fwa140m	Foxwall EMS (ALS) – Volunteer	ALS
gaa970m	Guardian Angel (ALS)	ALS
gyq219m	Guyastua (O’Hara) (QRS)	QRS
hib750m	Heidelberg (BLS)	BLS

hma145m	Hampton Twp EMS (ALS)	ALS
hpq236m	Holiday Park (Plum) (QRS)	QRS
ina760m	Ingram Ambulance (ALS)	ALS
jfa595m	Jefferson EMS (ALS)	ALS
kha770m	Kirwan Heights (ALS)	ALS
knnywdm	Kennywood EMS	BLS
lbq183m	Liberty (QRS)	QRS
lbw130m	Lower Burrell EMS	ALS
lnb610m	Lincoln Boro EMS (BLS)	BLS
lva150m	Lower Valley Ambulance (ALS)	ALS
mca130m	McCandless-Franklin Park EMS (ALS)	ALS
mhm630m	Munhall EMS	ALS
mka625m	McKeesport EMS (ALS)	ALS
mra191m	Northwest EMS, McKees Rocks (ALS)	ALS
mra780m	Medical Rescue Team South (ALS)	ALS
mrq174m	Middle Road (Indiana) (QRS)	QRS
murry	Murrysville Medic One	ALS
mvm350m	Monroeville EMS	ALS
nfa195m	Northwest EMS, North Fayette (ALS)	ALS
nkw120m	New Kensington EMS	ALS
nvm369m	North Versailles EMS	ALS
oaq215m	Oakdale (QRS)	QRS
orq269m	Oakridge (QRS)	QRS
pha380m	Penn Hills EMS (ALS)	ALS
pit100m	Pittsburgh EMS	ALS
pma485m	Plum EMS (ALS)	ALS
prm270m	Pulsar EMS	ALS
prq125m	Presto (QRS)	QRS
psa670m	Prism (ALS)	ALS
pua675m	Prism (ALS) Sub-Station	ALS
pva180m	Parkview EMS (ALS)	ALS
qvalley	Quaker Valley Ambulance Authority	ALS
rba730m	Robinson EMS *REMS (Crafton)	ALS
rba810m	Robinson EMS *REMS (Robinson Twp)	ALS
rda260m	Richland EMS (ALS)	ALS
ria193m	Robinson/Ingram EMS (ALS)	ALS
rnb775m	Rennerdale (BLS)	BLS
rsa210m	Ross-West View EMS (ALS)	ALS
sba815m	Southbridge EMS (ALS)	ALS
sca740m	Scott Twp EMS *STEMS EMS (ALS)	ALS
sgq240m	Spring Garden (Reserve) (QRS)	QRS

shq263m	Sharps Hill (Shaler) (QRS)	QRS
slq251m	Seville (Ross Twp) (QRS)	QRS
sma265m	UPMC St. Margaret Paramedic Response Team (ALS)	ALS
sna160m	Seneca Area EMS (ALS)	ALS
spb230m	Springdale EMS (BLS)	BLS
sra170m	Shaler Area EMS (ALS)	ALS
stq267m	Sturgeon (QRS)	QRS
svq262m	Shaler Villa (QRS)	QRS
swq278m	Swissvale (QRS)	QRS
tsm820m	Tricomunity South	ALS
twa6200	Tricomunity Washington County	ALS
unq233m	Unity (Plum) (QRS)	QRS
valley	Valley Ambulance Authority	ALS
veb650m	Versailles EMS (BLS)	ALS
vlq242m	Valencia (Richland) (QRS)	QRS
wda240m	West Deer EMS (ALS)	ALS
wdq289m	West Deer VFC #2 (QRS)	QRS
wha340m	Woodland Hills EMS (ALS)	ALS
woa645m	White Oak EMS (ALS)	ALS



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