CHAPTER 9
PREPAREDNESS FOR EMERGENCY RESPONSE

This chapter begins with an examination of the basic principles of emergency planning and outlines the process of assessing the emergency response organization's ability to perform four basic functions—emergency assessment, hazard operations, population protection, and incident management. Communities are most effective in preparing to implement these functions if they follow eight fundamental principles of emergency planning. In addition, emergency preparedness is supported by three recent organizational structures—the Urban Areas Security Initiative, Metropolitan Medical Response System, and National Incident Management System. The latter is implemented through the Incident Command System and the jurisdiction's Emergency Operations Center. The chapter continues with a discussion of Emergency Operations Plan development and concludes with a discussion of emergency preparedness by households, businesses, and government agencies.

Introduction

Emergency preparedness can be defined as *preimpact activities that establish a state of readiness to respond to extreme events that could affect the community*. It establishes organizational readiness to minimize the adverse impact of these events by means of active responses to protect the health and safety of individuals and the integrity and functioning of physical structures. As indicated in Chapter 3, emergency preparedness is achieved by planning, training, equipping, and exercising the emergency response organization. That is, members of the LEMC establish the basic plan, annexes, and appendixes of the jurisdiction's EOP, train members of the emergency response organization to perform their duties, and test the plan's effectiveness with emergency exercises. They must also acquire the facilities, equipment, and materials needed to support the emergency response. Finally, the LEMC should develop comparable organizational structures, plans, and preparedness for the disaster recovery phase. Recovery preparedness will be addressed in Chapter 11.

Emergency planning is most likely to be successful when it is viewed, either explicitly or implicitly, from a systems perspective (Lindell & Perry, 1992). This entails an understanding of the goals of the emergency response, the resources of the community as a system, and the functional interactions of the different units within the system. The *primary goal* of the emergency response is to protect the health and safety of the emergency responders and the public. In addition, the emergency response should protect public and private property and the environment, as well as minimize the disruption of community activities. The *resources* of the community include trained personnel, and emergency relevant facilities, equipment, and materials. The *units of the system* are the elements that take action (households, governmental agencies, private organizations), while *organizational functions* are defined as the "most general, yet differentiable means whereby the system requirements are met, discharged or satisfied" (DeGreene, 1970, p. 89). In the case of emergency response organizations, the description of system functions can then be elaborated into operational event sequences and component processes that include the identification of job operations, together with personnel positions and their associated duties (Kidd & VanCott, 1972; Buckle, Mars & Smale, 2000). In the conceptual design stage of a system, analysts define broad constraints that human limitations are likely to exert on system operation. As the system design develops in detail, the analysts develop correspondingly more detailed statements of the requirements for personnel qualifications and training, workgroup organization, workspace layout and equipment design, and job performance aids (Chapanis, 1970; Lindell, et al., 1982).

Such analyses are typically applied to the normal operations of complex technological systems such as high performance aircraft and the control rooms of nuclear power plants, but they also can be applied in similar form to the problems of community emergency planning. Whether a novel technological system is being developed for use in a normal environment or a novel social system such as an emergency response organization is being developed to respond to an unusually threatening physical environment, the rationale for systems analysis is the same—the opportunities for incremental adjustment through trial and error are extremely limited. The analysis of a social system conducted for an emergency management program must first identify the range of hazards to which a given community is vulnerable and the demands that the hazards would place upon the community.

The often expressed opinion “every emergency is unique” is true but the usual conclusion “we can improvise during an emergency rather than plan beforehand” does not follow. It is true that emergency responders must always improvise to meet the demands of a specific situation, but it is important to understand that there are different types of improvisation—reproductive, adaptive, and creative—that differ from *organizational continuity* (continuation of normal organizational routines) and *organizational contingency* (implementation of an EOP (Wachtendorf, 2004). Specifically, *reproductive improvisation* responds to a deficiency (e.g., failure of a siren) by using a substitute (e.g., police officers going door-to-door) to achieve the same emergency response objective. *Adaptive improvisation* involves modifying normal routines or contingency plans to achieve operational goals. In this context, “adaptive” only means a change, not necessarily an improvement. *Creative improvisation* responds to an unanticipated disaster demand by developing a new course of action.

It is important to recognize that improvising and implementing response actions takes more time than implementing preplanned actions—and time is usually very limited in an emergency. Moreover, improvisations can impede or duplicate the response actions of other organizations. For example, Perry, et al. (1981) reported that firefighters fed and sheltered flood victims because neither they nor the victims knew about a mass care facility that had been activated not far away. Consequently, emergency managers should develop community emergency preparedness so they can limit the amount of *unnecessary* improvisation even though they cannot eliminate improvisation altogether.

In fact, research has identified many regularities in the demands emergencies place upon response organizations (Dynes, 1970; Drabek, 1986; Tierney, et al., 2001). Emergency managers should identify the functions that must be performed to respond to these demands and the resources required to accomplish the response functions. The resources required for emergency response can then be compared with those maintained within the community. Any special actions required to ensure the continued availability of the emergency response resources can be made an integral part of the emergency preparedness program.

One very important aspect of the systems assessment for emergency response operations arises from the environmental conditions that prevail during major disasters. At such times, response personnel often confront confusing and conflicting cues about the current status of hazard agent and its impacts, as well as major uncertainties about the future behavior of the hazard agent and impacts yet to come. During the 1979 nuclear reactor accident at Three Mile Island and the chemical plant accidents in 1984 at Bhopal, India, and in 1985 at Institute, West Virginia, the inability of plant personnel to accurately assess the status of the emergency severely impeded their ability to communicate appropriate protective action recommendations to offsite agencies. A similar inability to conduct timely and accurate assessments on the Mt. St. Helens volcano led to casualties and property destruction. In all of these cases, the complexity of the situation—together with time pressure and the severity of the potential consequences—created conditions that were unforgiving of error and, thus, highly stressful for emergency response personnel.

To increase organizational effectiveness when there is enough time to respond, but not enough time to improvise a coordinated response plan, communities must engage in emergency preparedness. A major component in emergency preparedness is the development of preimpact EOPs that provide emergency responders with the resources they need to take prompt and effective response actions. This chapter will examine EOP development, emphasizing that plans are only a part of preparedness. The primary focus is on the planning practices of local agencies having explicit emergency response missions (e.g., emergency management, fire, police, and EMS). The chapter begins with the guiding principles of emergency planning and then turns to a discussion of the supporting analyses needed to adapt the plan to local conditions. It continues with an examination of the principal organizational structures involved in emergency preparedness—the Urban Areas Security Initiative (UASI), Metropolitan Medical Response System (MMRS), and National Incident Management System (NIMS). The latter is implemented through the Incident Command System (ICS) and the jurisdiction's Emergency Operations Center (EOC). The chapter concludes with a discussion of preparedness by households, businesses, and government agencies that do not have explicit emergency management missions.

Guiding Principles of Emergency Planning

Preparedness is best thought of as a *process*—a continuing sequence of analyses, plan development, and the acquisition of individual and team performance skills achieved through training, drills, exercises, and critiques (Dynes, et al., 1972; Kartez & Lindell, 1987, 1990). The practice of emergency response planning varies considerably among communities. In some, the planning process is quite formal; there is a specific assignment of responsibility to an office having an identifiable budget. In other communities it is informal; responsibility is poorly defined and a limited budget is dispersed among many agencies. Moreover, the planning products might be either written or unwritten. To some extent, the emergency planning process correlates with the size of the community in which it takes place. Larger communities— characterized by an elaborate structure of governmental offices, many resources and personnel, and perhaps higher levels of staff turnover—tend to evolve formalized processes and rely more heavily upon written documentation and agreements. In smaller communities, the planning process might generate few written products and rely principally on informal relationships. Formalization of the planning process is also likely to vary with the frequency of hazard impact. In communities subject to frequent threats, emergency response may be a practiced skill rather than a hypothetical action. In one frequently flooded community, the fire department evacuates residents of the low lying areas (in the usual manner, by fire truck, to the usual location, the local school) when the flood water reaches a certain street (Perry, et al., 1981).

Despite the many superficial variations in EOPs, researchers have identified some consistencies in emergency planning. The following prescriptions, derived from Quarantelli (1982b), can be described as fundamental principles of community emergency planning that are systematically related to high levels of community preparedness (see Table 9-1).

Managing Resistance to the Planning Process

Emergency planning is conducted in the face of apathy by some and resistance from others (Auf der Heide, 1989, McEntire, 2003, Quarantelli, 1982b). A basic reason for apathy is that most people, citizens and public officials alike, don't like to think about their vulnerability to disasters. A common objection to planning is it consumes resources, that, at the moment, might seem like more pressing community issues—police patrols, road repairs, school expansion, and the like. Planning mandates help (for example, radiological emergency planning after the Three Mile Island nuclear power plant accident and chemical emergency planning under the Emergency Planning and Community Right to Know Act of 1986—SARA Title III after Bhopal), but are insufficient to overcome such resistance. Consequently, the initiation of planning activities requires strong support from a jurisdiction's Chief Administrative Officer, an *issue champion* (or *policy entrepreneur*) who has the expertise and organizational legitimacy to promote emergency management, or a disaster planning committee that can mobilize a constituency in support of emergency management (Lindell, et al., 1996a, Prater & Lindell, 2000). However, acceptance of the need for emergency planning doesn't eliminate conflict. Organizations seek to preserve their autonomy, security, and prestige, so they resist collaborative activities that can threaten these objectives (Haas & Drabek, 1973). Emergency planning involves the allocation of power and resources (especially personnel and budget), so every unit within an organization wants its "proper role" recognized and a budget allocation commensurate with that role.

Table 9-1. Fundamental Principles of Community Emergency Planning.

1. Emergency planners should anticipate both active and passive resistance to the planning process and develop strategies to manage these obstacles.
2. Preimpact planning should address all hazards to which the community is exposed.
3. Preimpact planning should elicit participation, commitment, and clearly defined agreement among all response organizations.
4. Preimpact planning should be based upon accurate assumptions about the threat, typical human behavior in disasters, and likely support from external sources such as state and federal agencies.
5. EOPs should identify the types of emergency response actions that are most likely to be appropriate, but encourage improvisation based on continuing emergency assessment.
6. Emergency planning should address the linkage of emergency response to disaster recovery and hazard mitigation.
7. Preimpact planning should provide for training and evaluating the emergency response organization at all levels—individual, team, department, and community.
8. Emergency planning should be recognized as a continuing process.

Adopt an All Hazards Approach

The emergency planning process should also integrate plans for each hazard agent into a multihazard EOP. Emergency planners should use their community HVAs to identify the types of natural hazards (e.g., floods, tornadoes, hurricanes, earthquakes), technological accidents (e.g., toxic chemical releases, nuclear power plant accidents), and deliberate incidents (e.g., sabotage or terrorist attack involving hazardous materials) to which their communities are vulnerable. Following identification of these hazards, emergency planners should consider the extent to which different hazard agents make similar demands on the emergency response organization. When two hazard agents have similar characteristics, they are likely to require the same emergency response functions. Commonality of emergency response functions provides multiple use opportunities for personnel, procedures, facilities, and equipment—which, in turn, simplifies the EOP by reducing the number of functional annexes. In addition, it simplifies training and enhances the reliability of organizational performance during emergencies. Only when hazard agents have very different characteristics, and thus require distinctly different responses, will hazard-specific appendixes will be needed.

Promote Multiorganizational Participation

Emergency planning should promote interorganizational coordination by developing mechanisms that elicit participation, commitment, and clearly defined agreement among all response organizations. This obviously should include public safety agencies such as emergency management, fire, police, and emergency medical services. However, it also should include organizations that are potential hazard sources, such as hazardous materials facilities and hazardous materials transporters (pipeline, rail, truck, and barge) and organizations that must protect sensitive populations, such as schools, hospitals, and nursing homes. Coordination is required because emergency response organizations that differ in their capabilities must work in coordination to implement an effective emergency response. To perform their functions effectively, efficiently, and promptly requires members of the community emergency response organization to be aware of one another's missions, organizational structures and styles of operation, communication systems, and mechanisms (such as agreed upon priorities) for allocating scarce resources.

Rely on Accurate Assumptions

Emergency planning should be based upon accurate knowledge of community threats and likely human responses to those threats. Accurate knowledge of community threats comes from HVAs. As discussed in Chapter 6, emergency managers must identify hazards to which their communities are vulnerable, determine which geographical areas are exposed to those hazards (e.g., 100 year flood plains and toxic chemical facility Vulnerable Zones), and identify the facilities and population segments located in those risk areas. They also need to understand the basic characteristics of these hazards such as speed of onset, scope and duration of impact, and potential for producing casualties and property damage.

When identifying the hazards to which their community is exposed, planners and public officials frequently recognize the limits of their expertise. They recognize their lack of accurate knowledge about the behavior of geophysical, meteorological, or technological hazards and contact experts to obtain the information they need. Unfortunately, the same cannot usually be said about accurate knowledge about likely human behavior in a disaster. As a familiar saying goes, the problem is not so much that people don't know what is true, but that what they do “know” is false. As noted in the previous chapter, Quarantelli and Dynes (1972) and Wenger, et al. (1980) have described widespread myths regarding people’s disaster response that persist despite research refuting them. Belief in disaster myths hampers the effectiveness of emergency planning by misdirecting resource allocation and information dissemination. For example, officials sometimes cite expectations of panic as a reason for giving the public incomplete information about an environmental threat or withholding information altogether. This response to the myth of panic is actually counterproductive because people are more willing to comply with recommended protective actions when they are provided with complete risk information. For these reasons, the planning process must be firmly grounded not only on the physical or biological science literature on the effects of hazard agents on human safety, health, and property, but also on the behavioral literature describing individual and organizational response in emergencies.

Finally, household, business, and government agency emergency plans must be based on accurate assumptions about aid from external sources. In major disasters, hospitals might be overloaded; destruction of telecommunication and transportation systems (highways, railroads, airports, and seaports) could prevent outside assistance from arriving for days; and restoration of disrupted water, sewer, electric power, and natural gas pipeline systems could take much longer. Consequently, all social units must be prepared to be self reliant for as much as a week.

Identify Appropriate Actions while Encouraging Improvisation

An effective preparedness process must balance planning and improvisation (Kreps, 1991). The EOP establishes the emergency response organization's basic structure and broad strategies before a disaster strikes. In particular, it will document which organization is responsible for each emergency response function and, in general terms, how that function will be performed. Similarly, per-disaster training must explain how to perform any specific tactics and operational procedures that are likely to be needed during response operations. Even though emergency managers can forecast what types of disaster demands are likely to arise, there will always be some degree of uncertainty about the magnitude and location of those demands. For example, the emergency manager of a hurricane prone community should develop procedures for mass evacuation, but will be never be completely certain about how the population in each neighborhood will respond. The fact that people's response to warnings is reasonably well understood makes it foolish to improvise an evacuation plan as a hurricane is approaching.

Nonetheless, uncertainty about what proportion of the households in each neighborhood will begin an evacuation at each point in time makes it foolish to devise a rigid evacuation plan that has no provision for modification as an incident unfolds. An emphasis on specific detail can be problematic in at least four ways: (1) the anticipation of all contingencies is simply impossible (Lindell & Perry, 1980); (2) very specific details tend to get out of date very quickly, demanding virtually constant updating of written products (Dynes, et al., 1972); (3) very specific plans often contain so many details that the wide range of emergency functions appear to be of equal importance, causing response priorities to be unclear or confused (Tierney, 1980); and (4) the more detail incorporated into written planning documents, the larger and more complex they become. This makes it more difficult to use the plan as a device for training personnel to understand how their roles fit into the overall emergency response and consequently makes it more difficult to implement the plan effectively when the need arises.

In summary, planning and training should identify the actions that are most likely to be appropriate, but also should emphasize flexibility so those involved in response operations can improvise in response to unexpected conditions. That is, planning and training should address *principles* of response in addition to providing detailed standard operating procedures (SOPs) and should encourage improvisation based on continuing assessment of disaster demands.

Link Emergency Response to Disaster Recovery and Hazard Mitigation

There will be an overlap between emergency response and disaster recovery because some portions of the community will be engaged in emergency response tasks while others will have moved on to disaster recovery tasks (Schwab, et al., 1998). Moreover, senior elected and appointed officials need to plan for the recovery while they are being inundated with policy decisions to implement the emergency response. Consequently, emergency managers should link preimpact emergency response planning to preimpact disaster recovery planning. Such integration will speed the process of disaster recovery and facilitate the integration of hazard mitigation into disaster recovery (Wu & Lindell, 2004). The necessary coordination between preimpact emergency response planning and preimpact disaster recovery planning can be achieved by establishing organizational contacts, and perhaps overlapping membership, between the committees responsible for these two activities.

Conduct Thorough Training and Evaluation

Disaster planning should also provide a training and evaluation component. The first part of the training process involves explaining the provisions of the plan to the administrators and personnel of the departments that will be involved in the emergency response. Second, all those who have emergency response roles must be trained to perform their duties. Of course, this includes fire, police, and emergency medical services personnel, but there also should be training for personnel in hospitals, schools, nursing homes, and other facilities that might need to take protective action. Finally, the population at risk must be involved in the planning process so they can become aware that planning for community threats is underway, as well as what is expected of them under the plans. As noted previously, they need to know what is likely to happen in a disaster and what emergency organizations can *and cannot* do for them.

It is also essential that training include tests of the proposed response operations. As noted above, emergency drills and exercises provide a setting in which operational procedures can be tested. They also facilitate interorganizational contact, thus allowing individual members to better understand each other's professional capabilities and personal characteristics. Furthermore, multifunctional exercises constitute a simultaneous and comprehensive test of emergency plans and procedures, staffing levels, personnel training, facilities, equipment, and materials. Finally, multifunctional exercises produce publicity for the broader emergency management process, which informs community officials and the public that disaster planning is underway and preparedness is being enhanced.

Adopt a Continuous Planning Process

Finally, effective emergency planning is a continuing process. Hazard vulnerability, organizational staffing and structure, and emergency facilities and equipment change over time, so the emergency planning process must detect and respond to these changes. Unfortunately, this point is frequently not recognized. Wenger, et al. (1980, p. 134) have found "there is a tendency on the part of officials to see disaster planning as a product, not a process", a misconception that confuses tangible products with the activities that produce them. Of course, planning does require written documentation, but *effective* planning is also made up of elements that are difficult to document on paper and are not realized in hardware. These include the development of emergency responders' knowledge about resources available from governmental and private organizations, the acquisition of knowledge about emergency demands and other agencies' capabilities, and the establishment of collaborative relationships across organizational boundaries. Tangible documents and hardware simply do not provide a sufficient representation of what the emergency planning process has produced. Furthermore, by treating written plans as final products, one risks creating the illusion of being prepared for an emergency when such is not the case (Quarantelli, 1977). As time passes, the EOP sitting in a red three ring binder on the bookshelf looks just as thick and impressive as it did the day it was published despite the many changes that have taken place in the meantime. For example, new hazardous facilities might have been built and others decommissioned, new neighborhoods might exist where only open fields were found previously, and reorganization might have been taken place within different agencies responsible for emergency response. In short, the potential for changes in hazard exposure, population vulnerability, and the staffing, organization and resources of emergency response organizations requires emergency plans and procedures to be reviewed periodically, preferably annually.

Functional Capability Analysis

To ensure adequate emergency preparedness, emergency managers should analyze their emergency response organization's capability to perform its basic emergency response functions. Historically, these functions have been categorized as agent generated and response generated demands (Quarantelli, 1981a). The agent generated demands arise from the specific mechanisms by which a hazard agent causes casualties and damage, whereas response generated demands arise from organizing and implementing the emergency response. Lindell and Perry (1992, 1996b) elaborated Quarantelli's typology by drawing on federal emergency planning guidance (National Response Team, 1987; US Nuclear Regulatory Commission/Federal Emergency Management Agency, 1980) to define four basic emergency response functions. These are emergency assessment, hazard operations, and population protection (which are agent generated demands) and incident management (which encompasses the response generated demands). *Emergency assessment* consists of those diagnoses of past and present conditions and prognoses of future conditions that guide the emergency response. *Hazard operations* refers to expedient hazard mitigation actions that emergency personnel take to limit the magnitude or duration of disaster impact (e.g., sandbagging a flooding river or patching a leaking railroad tank car). *Population protection* refers to actions—such as sheltering in-place, evacuation, and mass immunization—that protect people from hazard agents. *Incident management* consists of the activities by which the human and physical resources used to respond to the emergency are mobilized and directed to accomplish the goals of the emergency response organization. The operational aspects of implementing these functions will be addressed in more detail in the next chapter, but rest of this section will address the actions that must be taken to prepare to implement them. These preparedness actions involve analyzing the disaster demands to identify the personnel, procedures, facilities, equipment, materials, and supplies the emergency response organization will need.

Emergency Assessment

Preparedness for emergency assessment requires the emergency response organization to *detect and classify an environmental threat*. Some natural hazards—such as many flash floods and earthquakes—are detected and classified by local agencies. Other natural hazards—such as hurricanes, tornadoes, major floods, and tsunamis—are detected and classified by federal agencies. Moreover, incidents at fixed site facilities are usually detected and classified by plant personnel, whereas transportation incidents are detected by carrier personnel, local emergency responders (e.g., police and fire), and sometimes by passers-by.

The local emergency manager should review the community HVA to identify all hazards to which the community is exposed in order to determine how detection is likely to be achieved and transmitted to the appropriate authorities. Locally detected hazards require the emergency manager to ensure the necessary detection systems (e.g., stream and rain gauges for flash floods) are established and maintained. For hazards detected by other sources, the emergency manager must ensure that a report of hazard detection can be called in to a community warning point that is staffed around the clock, usually the jurisdiction's dispatch center.

Another important aspect of emergency assessment is *hazard monitoring*, which requires continuous awareness of the current status of the hazard agent as well as projections of its future status. The technology for performing hazard monitoring varies by hazard agent. In many cases, continuing information about the hazard agent is provided by the same source as the one that provided the initial hazard detection. For example, the National Hurricane Center provides hurricane updates every six hours (or more frequently, if needed). Similarly, plant personnel should provide continuing information about a hazardous materials release.

Environmental monitoring is also needed when the geographical areas at risk are determined by atmospheric processes. As noted in Chapter 5, toxic chemicals, radiological materials, and volcanic ash are carried downwind, so changes in wind direction, wind speed, and atmospheric stability must be monitored to determine if the area at risk will change over time. Thus, procedures must be established and equipment acquired to obtain current weather information and forecasts of future weather conditions. Environmental monitoring is also needed for hazmat spills into waterways because, for example, the speed and direction of ocean currents determine which sections of shoreline will be affected.

Moreover, *damage assessment* is needed to identify the boundaries of the risk area and initiate the process of requesting a Presidential Disaster Declaration. Here also, personnel, procedures, and equipment must be designated to perform this function. Finally, *population monitoring and assessment* is needed to identify the size of the population at risk if the number of people in the risk area varies over time (e.g., tourists present in the summer but not in the winter). This requires emergency managers to maintain calendars of major events, such as festivals and athletic contests, that bring large numbers of people into their jurisdictions. It also necessitates working with schools, hospitals, and nursing home administrators to monitor the progress of special facility evacuations and with traffic engineers to monitor evacuation routes for risk area residents.

Hazard Operations

Preparedness actions for hazard operations vary significantly from one hazard agent to another. In some cases, hazard operations require equipment that is normally available within the community. For example, preparedness for structural fires, conflagrations, and wildfires mostly requires equipment that local fire departments use in routine methods of *hazard source control*. However, some hazard agents require special preparation. For example, chemical incidents might require special foams to suppress vapor generation. Area *protection works* are another type of hazard operations that is best illustrated by elevating levees during floods. The large number of sandbags needed for such operations also requires advance preparation. Moreover, some hazard agents such as earthquakes require special preparation for postimpact operations to implement *building construction practices* and *contents protection practices*. For example, heavy construction equipment is needed to stabilize buildings, extricate victims, and protect building contents from further damage.

Population Protection

Preparedness for population protection sometimes requires emergency managers to develop procedures for *protective action selection*. For some hazard agents, there is only one recommended protective action. People threatened by tornadoes or volcanic ashfall should shelter in-place whereas those threatened by lava flows, inland floods, storm surges, and tsunamis should evacuate. In other cases, such as toxic chemical and radiological releases, the appropriate protective action depends on the situation (Lindell & Perry, 1992; Sorensen, Shumpert & Vogt, 2004). Consequently, communities exposed to such hazards should develop procedures for protective action selection in advance.

Similarly, emergency managers should devise procedures for *warning* the risk area population for each of the different hazards identified in the community HVA. In slow onset incidents, such as main stem floods, there is likely to be adequate time for mechanisms such as face-to-face warnings. However, rapid onset incidents such as toxic chemical releases might require the acquisition of siren systems. Emergency managers should also prepare for *search and rescue* by considering whether special training and equipment is needed for swiftwater rescue from floods, heavy rescue from buildings collapsed by earthquakes, and other specialized circumstances. *Impact zone access control/security, hazard exposure control,* and *emergency medical care* require special protective equipment for emergency responders in CBR hazards so emergency managers should prepare for these hazards as well.

Incident Management

Because incident management activities are directed toward the response generated demands of an incident, preparedness for this function varies relatively little from one hazard agent to another. *Agency notification and mobilization* requires the acquisition of equipment such as pagers and the development of procedures such as the designation of watch officers to ensure that key personnel are notified rapidly. *Mobilization of emergency facilities and equipment* is achieved by acquiring critical documents (e.g., maps, plans, and procedures) and storing these in close proximity to the room that will be activated as the EOC (if the jurisdiction does not have a permanent installation). *Communication and documentation* are supported by the acquisition of radios, telephone systems, and personal computers as well as the establishment of procedures for message routing and recording. Emergency managers prepare for many of the emergency response organization's specific activities such as *analysis/planning*, *internal direction and control, logistics, finance/administration,* and *external coordination* by identifying the ways in which personnel will perform tasks or have reporting relationships that differ from the ones they encounter in normal conditions. The emergency manager can work with personnel assigned to the emergency response organization to devise organization charts, task checklists, telephone lists, and other job performance aids that will assist them in their emergency duties. Preparedness for *public information* can be facilitated by identifying a joint information center (JIC), providing extra phone lines for media personnel, and developing basic background information about the jurisdiction, its hazards, and the emergency response organization.

Organizational Structures for Emergency Preparedness

There are many organizational structures that have been developed to support emergency response to environmental hazards. Three of the most important are the Metropolitan Medical Response System (MMRS), Urban Areas Security Initiative (UASI), and National Incident Management System (NIMS). MMRS and UASI are federally funded programs that support interjurisdictional collaboration. NIMS includes a standardized structure for emergency preparedness and response titled the Incident Command System (ICS) that must link effectively to the jurisdiction's Emergency Operations Center (EOC). Each of these organizational structures is discussed below.

Metropolitan Medical Response System

The Metropolitan Medical Strike Team program was initiated in 1997 by the Department of Health and Human Services (DHHS), Office of the Assistant Secretary for Public Health Emergency Preparedness. The program quickly changed its designation to the Metropolitan Medical Response System to reflect both integration into local incident management systems and the extensive involvement of multiple governments, not just municipal agencies but also private sector organizations. Of the original 26 MMRS cities established before 1999, only two (Atlanta, Georgia, and Washington, D.C.) retained the strike team framework. In March, 2004, 124 city and regional MMRS programs had been established. These tend to be concentrated in high population density areas and other areas that are high probability terrorist targets, but 43 states have at least one MMRS program, yielding very broad geographic coverage and high levels of national population coverage.

The initial purpose of the MMRS program was to enhance local efforts to manage very large mass casualty incidents arising from terrorists' use of weapons of mass destruction (Perry, 2003). In part the program mission was driven by the realization that, for local governments, specialized federal assets for terrorist attacks are 48-72 hours away even under the best of circumstances. The MMRS program goal is to ensure cities can operate independently until support arrives and develop a strong local incident management system that can effectively and efficiently integrate specialized extra community (especially federal) resources. Unlike many federal programs, the MMRS purpose statement has evolved over time, largely in ways that emergency managers consider constructive. The focus has come to include CBR agents as well as any other agent (natural or technological) that could produce large numbers of casualties; it has become firmly established as an *all hazards* program. Perhaps the two most distinctive features of the MMRS program from a local government perspective are funding and organization. DHHS allocated funds directly to cities, eliminating concerns about funding losses to intermediate government levels and increasing purchasing flexibility for municipalities. The organizational constraint is that focal cities must create programs that include broad participation by municipal departments (not just fire and police), as well as county and state agencies and the private sector (e.g., hospitals). Although the funding conditions are generally considered a blessing, the organizational issues have been treated as (and undoubtedly are) significant challenges.

The most significant feature of an MMRS is that it links multiple response systems. Horizontal linkages involve first responders (e.g., firefighters, hazmat technicians, technical rescue technicians, emergency medical personnel), public health, emergency management, law enforcement, and medical and behavioral health services. There also are vertical linkages; for example, public health participation involves city, county, and state agencies. Also, private sector organizations are included in the planning process to establish contact with hospital emergency departments, environmental cleanup companies, ambulance systems, funeral director associations, and similar organizations that provide critical services in mass casualty incidents. MMRS cities must also plan for receipt and integration of important federal assets by building a relationship with the National Disaster Medical System (NDMS) and developing a capacity to receive pharmaceuticals from the national stockpile, as well as other specialized assets from a variety of federal programs.

Whether by design or not, the MMRS program has imposed a comprehensive emergency management process on recipient cities. Municipalities are required to operate an incident management system; link it to a jurisdictional EOC; enhance mutual aid agreements with surrounding communities; integrate county and state agencies; and conduct joint planning, training, and exercises on a continuing basis. MMRS program requirements address some mitigation and recovery issues, but emphasize preparedness and response. As a condition of declaring an MMRS "fully operational", each city must conduct a full scale exercise with federal evaluation. Achievement of operational status is treated at the federal level as only one milestone in the continuing development—through planning, training, and exercising—of an MMRS.

In March 2003, responsibility for the MMRS program passed from DHHS to DHS. Ultimately—except for the National Urban Search and Rescue Program—the MMRS program represents the only federally devised model for disaster operations that has been tested through repeated exercises and deployments. The challenge for the MMRS program is sustainability; to maintain "adequate funding and effective management of preparedness and efforts to keep domestic preparedness as a policy priority" (Grannis, 2003, p. 210). Through the years of DHHS oversight, funds to sustain established MMRS cities were made available, although on a highly variable basis. An indicator of the strength of the program and proof of serious local commitment is that cities kept their MMRS programs alive, even during years of small federal allocations, by making hard choices about the distribution of local resources. Funds to sustain the established MMRS programs have continued under DHS, but future federal support is no more guaranteed for MMRS than for any other program. No new MMRSs have been established since 2003, but this program appears to be one significant success in a long history of federal efforts to promote local emergency management where successes have been rare. Interestingly, the FY2005 allocation for the federal MMRS Program decreased to slightly more than $29 million, down from $50 million in FY2004. The 2005 allocation was also subject to retention of 20% at the state level, making the federal commitment to the successful MMRS cities even more tenuous.

Urban Areas Security Initiative (UASI)

In July of 2002, President Bush approved the *National Strategy for Homeland Security* as a framework for national efforts to prevent and respond to terrorist actions. Beginning in 2003, the DHS Office for Domestic Preparedness (ODP, formerly part of the Department of Justice) inaugurated the Urban Areas Security Initiative as part of the National Strategy for Homeland Security. In late 2003, President Bush approved the FY2004 Homeland Security Appropriations Act, which continued and expanded UASI at a funding level exceeding $4 billion. Seven urban areas were approved for funding in 2003, and that number grew to 50 in 2004. For 2005, DHS added seven new UASI jurisdictions while, without public explanation, discontinuing funding for seven urban areas that had been funded in 2004. The financial awards were substantial, ranging in FY2005 from a high of more than $207 million to New York City to a low of $5 million for Louisville, Kentucky. In addition to these grants, 25 mass transit systems (heavy rail and commuter rail systems) were funded in 2004 on the basis of ridership and total system miles.

Former DHS Secretary Tom Ridge (U. S. Department of Homeland Security, 2004d, p. iii) stated the purpose of UASI is to "create a sustainable national model program to enhance security and overall preparedness to prevent, respond to, and recover from acts of terrorism." In launching UASI, technical vulnerability assessments were used to identify high threat, high population density areas to participate in the program. The level of funding assigned to urban areas has been based in part upon the vulnerability assessments and other needs assessments. UASI does not impose a generic response model on participating urban areas, but requires local governments located around a designated core city to cooperate in developing a strategic plan that either creates anew or supplements existing disaster plans for terrorist attacks anywhere in the urban area. UASI then authorizes program expenditures across five areas: planning, equipment acquisition, training, exercises, and management and administration (the latter is limited to 3% of the total allocation). The funding mechanism is intergovernmental, with federal money being allocated to states (which can retain up to 20%) that, in turn, distribute funds to local governments. Local governments receive funds based on the area's strategic plan as well as agreements among the core city's Urban Area Administrator, participating municipal governments, and county and state emergency management agencies. All expenditures are subject to federal review.

These general funding rules for UASI continued through the FY2005 allocations, although DHS has changed its approach to funding local government programs. The DHS Office of State and Local Government Coordination and Preparedness (SLGCP) Office for Domestic Preparedness has created a program that combines the application process for six major federal programs and delegates the responsibility for that process to state governments. The programs brought under this umbrella application process are UASI, the MMRS Program, the State Homeland Security Program, the Law Enforcement Terrorism Prevention Program, the Citizen Corps Program, and Emergency Management Performance Grants. Some of the budget allocations appear to have increased, whereas others decreased from previous years. It is clear that this new process gives states additional resources (programs like MMRS which were previously immune to the 20% funds retention by the state under UASI are now subject to the retention), but also a considerably greater administrative role and burden. It is not clear how effectively this consolidation of programs will be implemented by the federal government and states, nor how well it will be received by local governments.

For the most part, emergency managers view UASI as promising. It provides substantial funding for local needs (rarely accomplished by previous federal programs) and allows a degree of local choice in planning, administration, and funding. Another positive point is that 47 core cities of the 50 UASI urban areas already had existing MMRS programs. This means they had already engaged in substantial emergency planning and, therefore, possessed an existing structure on which to build further capability. Complaints include concern that federal authorities tightly define authorized expenditures within each predetermined budget category and that local governments bear a substantial financial accounting load. There is also concern that the pass-through mechanism from federal to state and then to local agencies is complex and administratively demanding, thus risking the diversion of funds from emergency preparedness to other uses. Finally, if UASI is to succeed in creating a functioning local emergency management capability, there must be high levels of continuing cooperation among federal, state, county, and municipal governments—and particularly among the municipal governments within each urban area. Sylves' (1991) work on the inherent difficulties with intergovernmental relations indicates the required agreements on operational plans and budget allocations will prove to be serious challenges.

At the present time, there is little basis for judging the success of the UASI program. Not only is the program new, but plans must be kept secure to avoid divulging their contents to potential adversaries. When combined with the usual administrative and operational hurdles to data collection, these obstacles inhibit the amount of information available in the open literature that can be used to evaluate the program. Most urban areas funded in the FY03 budget cycle obtained federal approval of strategic plans, but implementation requiring such intense intergovernmental collaboration and massive equipment purchases can be expected to be slow under even the best of circumstances. There has simply not been time to establish a capability that could be evaluated in functional or full scale exercises. Although many of these urban areas have MMRS programs that provide emergency management system models, it is not clear if the UASI strategic plans build upon these capabilities, revise them, or change them entirely.

The National Incident Management System

The concept of incident management systems is neither new nor confined to traditional emergency management. Incident management has military origins and law enforcement agencies have long used the Incident Command System (ICS) for large scale incident response. Both ICS and IMS (Incident Management System, Brunacini, 1985) are preplanned organizational structures for emergency response that will be treated here as interchangeable, although there are small differences that will be discussed in the next section. In fact, an important issue regarding IMS/ICS is the confusion about meaning; different professions, different professionals, and different times have embraced different meanings. Municipal fire departments use IMS and the National Fire Protection Association adopted a standard (NFPA 1561) on emergency services IMSs in 2000. Similarly, the Law Enforcement Incident Command System (LEICS) was systematized and endorsed by the Police Officers Standards and Testing organization (Bartosh, 2003). The Hospital Emergency Incident Command System (HEICS), used in public health organizations, originated with the Orange County, California, Emergency Medical Services Agency and has diffused widely through the medical community.

In addition to the myriad systems currently available for incident management, the federal government has now required NIMS. Homeland Security Presidential Directive Number 5 (HSPD-5), a direct response to multijurisdictional, multiorganizational problems arising in the response to the September 11th attacks, established NIMS as part of the US National Response Plan. The Department of Homeland Security (2004b) issued the documentation for NIMS on March 1, 2004. HSPD-5 required all federal agencies to adopt NIMS immediately and all state and local organizations to adopt NIMS as a condition for federal preparedness funding by FY2005. The State of California negotiated with DHS to retain SEMS (a standardized emergency management system it had developed before NIMS), but the overall reception of the NIMS among other emergency responders is currently unknown.

While all IMSs focus on the operational response to an incident, NIMS addresses this issue and also many others that are considered to be emergency preparedness rather than emergency response activities. There are six components to NIMS (US Department of Homeland Security, 2004b). The first, labeled *command and management*, includes the traditional component of ICS (NIMS here uses ICS rather than the more conventional IMS term), plus a definition of "multiagency coordination systems" and "public information systems". The ICS described here appears to be almost identical to California's SEMS (which also is more comprehensive than a simple ICS) and similar to a traditional fire service IMS. What DHS identifies separately as multiagency coordination systems and public information systems overlap the structure of traditional fire services incident management. The conventional version of IMS structurally accommodates the need to link with incident management systems operated by different classes of agencies and governments (e.g., public works, EMS, law enforcement, hospitals) and includes joint information systems to disseminate incident information to the public (Brunacini, 2002). These same features also characterize all municipal MMRS programs.

The second component of NIMS is labeled *preparedness* and "involves an integrated combination of planning, training, exercises, personnel qualification and certification standards, equipment acquisition and certification standards, and publication management processes and activities" (US Department of Homeland Security, 2004b, p. 4). Much of this component appears to be conventional guidance that, to maintain any ICS (or IMS), one needs to engage in planning, training, and exercising, as well as develop mutual aid pacts. The parts that are both different and confining include the notion that DHS will issue standards and test personnel to certify their ability to perform "NIMS-related functions." This certification process also will be applied to equipment. Finally, this component specifies that forms used in ICS—including the incident action plan, organization assignment list, and many others—be standardized by federal fiat. Indeed Appendix A, Tab 9 of the *National Incident Management System* reproduces facsimiles of appropriate form formats (US Department of Homeland Security, 2004b, p. 105-120).

The *resource management* component of NIMS is complex and extensive. There is a requirement for inventorying resources, along with a DHS supplied "resource typing system", that provides specific definitions of each type of resource and how it is to be categorized. There are also rules for determining what resources are needed for an incident, as well as how they are to be ordered, mobilized, tracked, reported, and recovered. Finally, there is a section requiring certification and credentials for personnel, but it is unclear from the description whether this means resource management personnel must be certified or whether they are charged with ensuring incident command personnel and equipment are properly certified.

The final three components of NIMS are less well defined than those just discussed. The "communication and information management" component develops standards for communications (including interoperability between responder organizations) at an incident and specifies processes for managing incident information. The *supporting technologies* component exhorts locals to acquire and continually review the availability of new technology for incident management. The *ongoing management and maintenance* component "establishes an activity to provide strategic direction for and oversight of the NIMS, supporting both routine review and the continuous refinement of the system and its components over the long term" (US Department of Homeland Security, 2004b, p. 6)

It is difficult to evaluate NIMS at this stage of implementation. With regard to its origins, "Both NRP [National Response Plan] and NIMS have been developed in a top down manner, centrally coordinated by DHS… [and] [v]iews differ on the scope and intent of stakeholder involvement in developing NRP and NIMS." (Hess & Harrald, 2004, p. 2). It appears that disaster research was minimally considered, if at all, in the process of generating NIMS. It is unclear how other guidance was solicited by DHS, from whom, or how it was incorporated. Drafts of the NRP were widely distributed via electronic mail along with requests for comment and many of these messages reached municipal emergency managers. What appears to be an even greater concern to municipal emergency management and response agencies is the detail in which processes and protocols are specified within NIMS. In what could be regarded as a significant understatement, Christen (2004, p. 96) states that, in the fire service, "not everyone is happy with national standards and protocols that supersede local preferences." More important is the question of whether such detailed specification promotes or retards the effective and efficient management of emergencies and disasters.

On a practical level, the likelihood of successful NIMS implementation is difficult to estimate. There is no doubt DHS can impose a requirement for agencies accepting federal disaster preparedness funding to adopt NIMS. However, effective implementation is quite a different matter from official adoption. A veneer of nominal adoption sometimes substitutes for the reality of an executable capability at the local level. The ICS component is similar to the IMS that is used by most large fire services agencies in the United States, although implementation by public works, hospitals, and law enforcement agencies is difficult to estimate. To effectively operate an IMS, an agency must address the planning, training, and exercising issues contained in other NIMS components. There are serious practical challenges—including a reliance on intergovernmental relationships that has plagued implementation efforts for other federal programs. As another example, immense resources will be required for DHS to produce standards and annually test and certify every command officer in the United States. If equipment must also be certified, the task will be even more daunting, especially when one remembers NIMS is designed for federal, state, local, and tribal governments (Ridge, 2004). The Phoenix Fire Department operates a Command Training Center for certifying its own command officers (and others from the surrounding region), but the simulation models, props, computers, and software require a financial investment far beyond the resources of most fire departments. Hence, even if the certification and testing were passed to local jurisdictions, many would be overwhelmed and would likely see the process as another "unfunded federal mandate". For local agencies that do not routinely use some ICS or IMS or use it infrequently, the additional resources required to comply with NIMS will be substantial. DHS has created a "NIMS Integration Center" (with a Web site at www.fema.gov/nims) as part of the federal effort to manage NIMS and answer questions regarding system adoption. In addition, the DHS/FEMA Emergency Management Institute offers multiple online classes that address both NIMS and basic ICS.

Organizational Structures for Emergency Response

Organizational structures for emergency response must be based on two basic principles. First, the organizational structure used to respond to everyday emergencies will form the basis of an expanded structure to deal with disasters. Second, the local response structure must be flexible enough to readily expand as additional external resources are added to match the increasing agent generated and response generated demands of the disaster. The prevailing organizational structures for emergency response are ICS and IMS. These two organizational structures differ, but relatively slightly.

Incident Command System/Incident Management System

For many years, the federal government provided state and local governments with criteria for evaluating their EOPs (US Nuclear Regulatory Commission/Federal Emergency Management Agency, 1980; National Response Team, 1987, 1988; Federal Emergency Management Agency, 1988, 1990, 1996b). However, it avoided requiring—or even recommending—a specific structure for emergency response organizations to meet those criteria. In part, that reluctance seems to have been based on the principle that a federal system should allow state and local governments to meet the federal planning criteria in any way that they deemed appropriate. Moreover, as a practical matter, state governments across the country differ from each other in their normal organizational structures and resources, as do local governments. Consequently, the imposition of a single structure for emergency response organizations might have seemed doomed to failure. The consequence of the federal government's performance oriented (rather than prescriptive) approach was a proliferation of organizational structures, positional titles, resource names, and operational procedures that sometimes impeded interjurisdictional cooperation—even among identical emergency response agencies (e.g., fire departments) from neighboring jurisdictions.

Following a major series of wildfires in Southern California in 1970, fire departments joined to address the lack of a common organizational structure, inadequate emergency assessments, poorly coordinated planning, uncoordinated resource allocation, and inadequate interagency communications at the incident scene. This led to the development of the ICS, which can be summarized in terms of seven basic principles (cf. Irwin, 1989, see also National Wildfire Coordinating Group, 1994; National Response Team, no date). First, all jurisdictions use a common organizational structure that encompasses standardized names and functions for subunits (*standardization*). This includes standardized names and duties for individual positions to make personnel from different jurisdictions interchangeable. Second, there is a division of labor, so each unit is assigned a specific function to perform (*functional specificity*). Third, subunits are established to limit the number of personnel directly supervised by each unit manager (*manageable span of control*). This is usually five subordinates, but the number can range from three to seven. Fourth, personnel from a given professional discipline (e.g., police or fire) are assigned to the same unit in the emergency response organization to facilitate teamwork and also to simplify recordkeeping (*unit integrity*). Fifth, most incidents are managed by a single Incident Commander (IC), but a Unified Command team manages the emergency response when multiple agencies have statutory authority and responsibility for a specific type of incident (*unified command*). Sixth, senior incident managers develop action plans that include specific, measurable objectives and evaluate their effectiveness by monitoring the achievement of these objectives (*management by objectives*). Seventh, the IC or Unified Command team direct the allocation of all resources—including personnel, facilities, vehicles, and equipment—to emergency response tasks (*comprehensive resource management*).

Over the next decade, ICS received increasing support as a collection of organizing rules designed to serve the needs of fire and police departments (Kramer & Bahme, 1992). Unfortunately, the way in which ICS was implemented tended to be region specific and, in some cases, idiosyncratic to a single jurisdiction. By the 1980s, the fire services in particular became concerned that responding departments needed a common ICS to increase the effectiveness of response to larger incidents. With funding from FEMA, FIRESCOPE (Firefighting Resources of Southern California Organized for Potential Emergencies) developed a version of ICS that was ultimately adopted and promoted by the FEMA (Federal Emergency Management Agency, 1987). FIRESCOPE ICS is a planning based emergency response system that combines planning functions with the functions of an EOC. Planning and coordination is achieved by a multiagency coordination system (MAC) that is operated by a team of agency directors and divided into two functional tasks. The first is a computer-based Fire Information Management System that stores fire relevant data. The second is an operations coordination system that implements policy devised by the MAC. The EOC component of FIRESCOPE comprises sections that deal with issues of field operations, logistics, planning and finance.

Although this version of ICS was tailored specifically to large scale incidents and to the jurisdictional structure of Southern California fire services, it was a major improvement over previous systems (Coleman & Granito, 1988; Lesak, 1989). The basic system was very popular and promising, but was used for several years only on major multijurisdictional emergencies, rather than for minor fire department incidents. With support from the National Fire Protection Association, Brunacini (1985, 2002) adapted and enhanced the FIRESCOPE system so it could be used as readily in small events as large ones. Brunacini changed the command function to include specialized advisors, expanded the operations function to include routine departmental response demands (hazardous materials response, technical rescue, evacuation, etc.), and included explicit connections to a municipal EOC and police incident commanders. The advantage of this revised structure, called the Incident Management System (IMS), was that daily use on all incidents—minor and major—would enhance the effectiveness of the system when it needed to be used in the rarely experienced major incidents. IMS is now widely used in the American, Canadian, British, and Australian fire services. For more than a decade, the

Oklahoma State University Fire Services Program and the National Fire Protection Association have provided IMS instruction in the US and internationally. DHS is in the process of requiring all jurisdictions to adopt the NIMS version of ICS as a condition for reimbursement of disaster expenses. Despite this requirement, this chapter will discuss IMS as it has been implemented by Phoenix Fire because the differences from NIMS/IMS are not substantial. In addition, Chapter 10 will show that both of these systems lack adequate structures for managing large scale population protection tasks effectively.

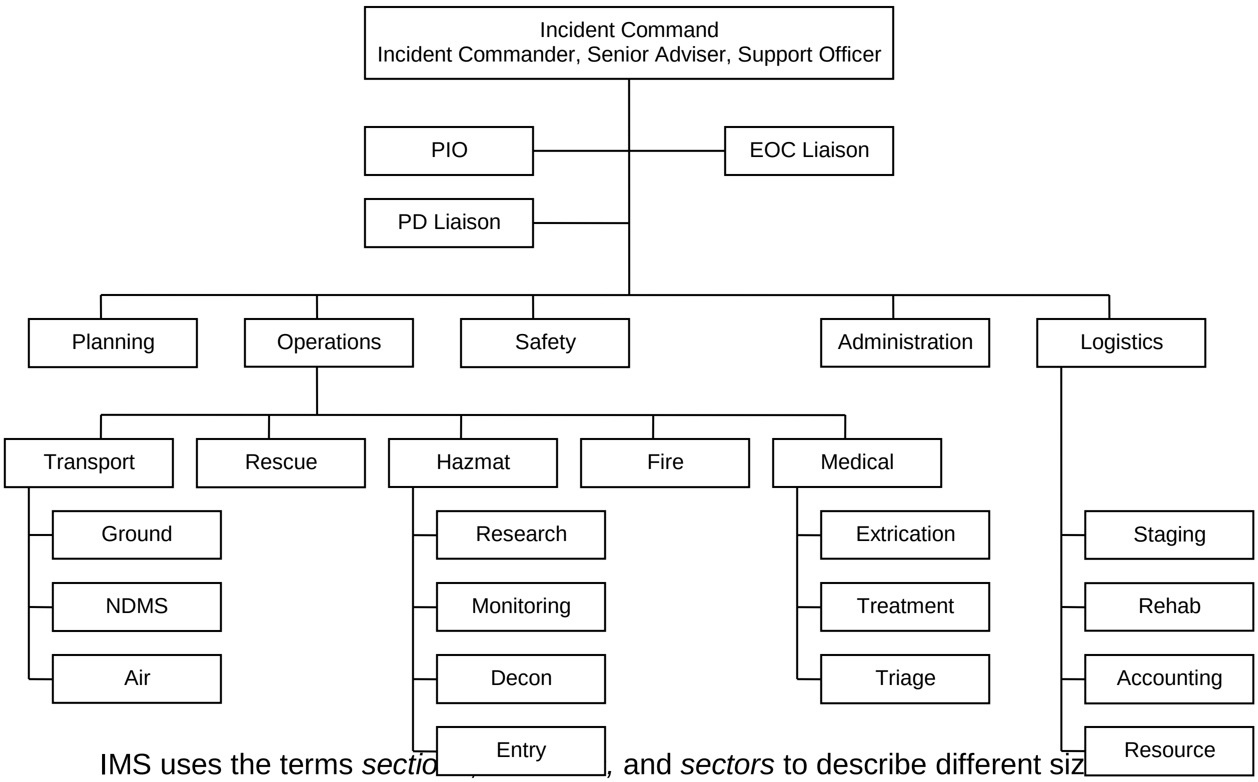
A principal consequence of IMS is to make all resources of the jurisdiction available for every incident, whether it is a routine emergency or a communitywide disaster. The resources are provided automatically, as the IC escalates the response to meet the emerging incident demands. The IMS itself is a field structure that can manage resources at multiple impact scenes from an Incident Command Post. In such cases, the IMS might not necessarily be supported by activation of an EOC, especially in minor incidents. In disasters that are diffuse and present no real geographic location for scene operations, the jurisdictional EOC can assume the role of the onscene Incident Command Post in using IMS to manage the emergency response. This would be particularly likely in response to a terrorist attack involving a biological agent where impacts might not be detected until long after the attack, at which point the source might be unclear and remain the subject of investigation.

The advantage of using the local IMS (supplemented by a jurisdictional EOC) as the basis for emergency and disaster response lies in its enhancement of the ability to quickly and effectively initiate emergency operations. Thus, every incident is initially addressed by trained and equipped emergency responders guided by an IC. These personnel are always on duty, responding to all calls. Especially in CBR terrorist threats, this approach reduces the chance that untrained, unprotected responders will enter an incident scene and become casualties themselves. Whether the incident is known to be a disaster (such as a major flood, hurricane, or chemical plant incident) or initially appears to be a routine incident that becomes a disaster (e.g., an emergency call for "people down" is the first indication that terrorists have launched a chemical attack), IMS is an organizational structure for emergency response that is already established and can be expanded to fit situational demands.

Basic IMS Principles

The IMS as a system is built around responsibilities vested in standardized roles rather than the idiosyncratic abilities of individuals. The fundamental principle of IMS is that there must always be one (and only one) IC at every incident scene. In principle, any emergency responder may assume the role of IC. In practice, however, the IC is usually the first arriving company officer (usually of an engine company or ladder company) or Battalion Chief (supervisor). Thus, it is the duty of the most senior officer who is first to arrive at the incident scene to assume command. Once established, command may be transferred to other more senior officers as they arrive. Figure 9-1 shows a fully implemented IMS structure that would be appropriate for a major disaster, but IMS size and composition expand as the IC seeks to meet incident demands. Thus, the structure begins with the assumption of command and the designation of specialized functional units to address the hazard at the scene. This includes responding to agent generated demands that involve addressing the threat itself (e.g., a fire; structural damage; victim rescue, treatment, and transportation). It also includes dealing with response generated demands that involve supporting the emergency responders (e.g., logistics of acquiring needed equipment and supplies; rescue for endangered responders) and coordinating with other agencies (e.g., communicating information about the incident to the EOC and the public).

Figure 9-1. Sample IMS Organizational Structure.



IMS uses the terms *sectio* … *,* and *sectors* to describe different siz … groupings of personnel, equipment, and apparatus. In Figure 9-1, *Command* is shown with five sections directly attached to it. The five sections—*Planning*, *Operations*, *Administration*, *Safety*, and *Logistics*—are staffed as appropriate to the incident size and conditions. Section chiefs in the Incident Command Post work with the Command staff to formulate an overall emergency response strategy. The section chiefs then direct and monitor tactical operations, whereas branch and sector officers implement tactical operations. In a fully implemented IMS, *branches* are established under sections and are functional tactical areas relevant to each section. For example, Figure 9-1 shows five branches under the operations section—transport, rescue, hazardous materials, fire, and medical.

The naming of branches follows the specific activity they perform; the number of branches depends upon the intensity of the demand for each of the functions needed in the incident response. Thus, an IMS for an urban earthquake would include a heavy rescue branch. Sectors are defined beneath branches and execute specific tasks. Typically, sectors contain fire companies or special teams. Branches and sectors are activated in response to (or, better still, in anticipation of) incident demands. Hence, in small hazardous materials incidents where few victims are present, the medical branch would be only a single unit and is called a medical sector. In events where there is no fire, the fire branch would not be activated. Although basic principles of IMS are easy to grasp, more advanced concepts provide a complex method of allocating responsibility for response strategy, tactics, and tasks (Brunacini, 2002; Carlson, 1983).

As indicated earlier, there are some differences between IMS and ICS structures. Under ICS, there is neither a Senior Adviser nor a Support Officer. Instead, there is a Scientific Officer in the Command Section and the Safety function is staffed by a single officer in the Command Section rather than by a separate section. Moreover, ICS has only a single Liaison Officer rather than separate police and EOC liaisons. Finally, ICS defines Finance and Administration as two separate sections rather than combining them as in IMS.

IMS Implementation

In larger incidents, the IC may be supported by a Support Officer and Senior Advisor. Senior officers typically fill these two additional roles within the IMS Command section as they arrive at the scene. After assuming command, the IC establishes a command post and, throughout the incident, performs seven activities.

- Conduct initial situation evaluation and continual reassessments
- Initiate, maintain, and control communications
- Identify the incident management strategy, develop an action plan, and assign resources
- Call for supplemental resources, including EOC activation
- Develop an organizational command structure
- Continually review, evaluate, and revise incident action plan
- Provide for continuing, transferring, and terminating command

Through these duties, the IC develops and maintains the strategy and resources that will be needed to terminate the incident. The Senior Advisor and Support Officer perform duties assigned by the IC—including reviewing, evaluating, and recommending changes to the incident action plan. In particular, the *Senior Advisor* focuses on the overall incident management or “big picture” issues. This officer monitors the overall incident, evaluating possible responses to current and future incident demands in order to determine the need for activating additional branches or sections. The Senior Advisor also evaluates the need for liaison with other jurisdictional departments, outside agencies, public officials, property owners, tenants, and other parties impacted by the incident. In addition, the *Support Officer* provides direction related to tactical priorities, critical factors, and safety. Thus, this officer assists with creation of tactical worksheets (written plans) for control and accountability and evaluates the viability of the response organization and span of control. The Support Officer also evaluates the need for additional resources at the scene and assigns logistics responsibilities.

When there is a major emergency or a community-wide disaster, most jurisdictions provide for the Command staff to be supported by an onscene *Public Information Officer* (PIO) and a *Police Liaison* to the law enforcement command posts In addition, there is an *EOC Liaison* who is responsible for coordination between the incident scene and the EOC. The goal of an *Articulated Command* is to spread the functions to specialists where possible, permit effective communication with responders on scene and emergency authorities off scene, and allow the IC to focus on the incident demands.

As soon as it is practical, Command establishes a *Public Information Sector* to deal with the mass media and provide the information the media will need to accurately report the status of the incident and the response to it. The staff PIO directs the sector, establishes a media area that does not impede operations (as necessary), and gathers information about the incident. In a major incident, the onscene PIO coordinates with the EOC PIO and PIOs of other responding agencies to insure consistent, accurate information dissemination and to avoid release of potentially sensitive information.

In complex incidents, particularly suspected or identified terrorist attacks, Command assigns a *Police Liaison Sector*. A police supervisor's presence may be requested in the Fire Command Post or communications may be directly established with the Police Command Post. The Police Liaison Sector deals with all activities requiring coordination between the two departments, including (but not limited to) traffic control, crowd control, incident scene security, evacuations, crime scene management, and persons interfering with Fire Department operations.

Within the IMS structure, Command delegates responsibility for implementing its emergency response strategy to the five section chiefs. The *Planning Section* is charged primarily with technical liaison, forecasting incident demands, and other planning functions. The Planning Section serves as the Incident Commander's "clearinghouse" for information. In CBR incidents, this function is particularly critical because specialized information from a variety of specialists (e.g., toxicologists and physicians) will flow to the scene, and the Planning Section relays information from these sources to Command.

The *Operations Section* deals directly with all hazard source control activities at the incident site. In addition, this section is responsible for the safety and welfare of personnel working within the section. A critical administrative duty of the Operations Section is to establish branches that accomplish specific tasks to meet incident demands. The Operations Section creates and oversees as many branches as needed depending on the demands of the specific incident. Branches typically include primary operational functions: transport, rescue, hazmat, fire, and medical. Transport Branch is responsible for transporting injured persons from the incident scene to hospitals for definitive care. Rescue Branch is charged with search and rescue and extrication of firefighters who become lost, trapped, or endangered. This branch may oversee a potentially large number of units serving as Rapid Intervention Crews (RIC units) commensurate with the size of the incident. RIC units stage, at full ready, with the exclusive responsibility of first responder rescue. In addition, an Evacuation Branch or Sector can be created to deal with endangered citizens.

The Hazardous Materials Branch typically houses four sectors representing the four principal functions of research, monitoring, decontamination, and site entry. In a hazmat incident, the Hazardous Materials Branch addresses critical response priorities; identifies the hazard agent; designates hot, warm, and cold zones; and coordinates with law enforcement resources for site access control and special services (e.g. Bomb Squad or Special Weapons and Tactics). To assist in agent identification, this branch is supported by the Planning Section, onscene toxicology specialists (if appropriate), and other specialized personnel operating in the EOC. An Entry Team Sector is responsible for hot zone entry and is supported by a Backup Team Sector. The latter is present for relief or rescue of the entry team. Although emergency decontamination of victims can begin with the first units on scene, the Hazardous Materials Branch assembles specialized decontamination lines and equipment and performs technical decontamination.

Fire Branch is charged with the management and suppression of fires and, as appropriate, operates sectors (a tactical or task level function). Fire Branch is charged with the suppression of fire in the incident. When fire occurs in context of other hazard agents such as explosives or hazardous materials, Fire Branch confers with the Incident Commander to identify priorities. In some cases, Fire Branch will operate in a defensive posture until other hazards have been addressed and then shift to offensive operations to extinguish fire. In the operational phase, Fire Branch operates a safety sector that includes one company in reserve for rapid rescue of trapped firefighters. Building related (e.g., inside, lobby, outside) sectors are used in high rise incidents to control access and conduct inside firefighting. Directional sectors (e.g., north, south, roof) are established for both defensive and offensive attacks. After the fire has been declared to be controlled and flames are knocked down, the Overhaul Sector is established to search for and extinguish any remaining active fire. Depending upon the materials burning, the Overhaul Sector will remain at the site for long periods to extinguish spontaneous combustions.

The Medical Branch coordinates the activity of sectors and/or units to address extrication, triage, and treatment of patients. The Extrication Sector is responsible for locating, extricating, and removing patients to treatment areas. Triage Sector performs the initial assessment of patient conditions and treatment needs. In hamat incidents, this function may be performed before, simultaneously with, or after decontamination. The toxicity of the agent determines victim assessment and, in the case of nerve agents, the timing of antidote administration. Triage and initial treatment may also be performed within the Extrication Sector, depending upon the stability of the area where patients are located. Similarly, contingent upon the agent, antidote administration may be appropriate at the earliest moment. In such cases treatment and extrication personnel with appropriate personal protective equipment (PPE) would begin administration prior to or during mass decontamination. When time is not critical to survival, antidote administration may take place at treatment areas, which can also serve as patient collection areas. Triage tags are used to categorize patient injuries and record treatments administered in the field. The triage tag number also becomes the tracking mechanism for patients.

Particularly in a hazmat incident, Behavioral Health will operate as a sector within the Medical Branch. These personnel and units may be assigned in a variety of activities at the scene. The onscene Behavioral Health Coordinator works through the Medical Branch Officer while maintaining liaison with the Planning Section and the EOC (if the latter has been activated). Behavioral Health units, with appropriate PPE, may oversee and assist patients awaiting decontamination, during decontamination, in treatment, and during transportation.

The Transportation Branch can expand as incident demands escalate, typically to four sectors. Transport north and south represent different directional movement points for ground transportation to local hospitals or mass care facilities (usually established through the Red Cross contact in the EOC). This movement may involve different vehicles as appropriate to patient needs, including buses for uncontaminated or decontaminated “walking wounded”, as well as ambulances or other vehicles obtained through the National Guard, public transit, or other organizations. The jurisdictional fire department might operate its own ambulance system, and formal agreements (as well as mutual and automatic aid agreements) should be established for transport vehicles from local EMS providers and ambulance services. The Air Sector moves patients by rotary wing aircraft if this is safe, given the hazard agent involved and the requirements of the patients' conditions. Finally, the NDMS Sector prepares patients in accordance with the local NDMS plan and moves them to the designated collection point for transport to other locations.

The *Safety Section* is staffed by a Safety Officer who is responsible for mobilizing this unit and maintaining safe operations at the incident scene. This officer's primary task is to develop and implement plans for rescue, incident scene safety practice, and environmental remediation after emergency response operations have been terminated. In large incidents, the Safety Officer is supported by additional personnel who monitor reports from all incident scenes and report progress to the Command Section. If safety observers discover a pattern of unsafe practices, the Safety Officer is authorized to stop operations at an incident scene.

The *Administration Section* focuses on procurement, cost recovery, liability, and risk management. These activities involve contracting with vendors to deliver services that cannot be provided by the responding agencies and recording the time of use for rental equipment. They also include establishing resource sharing agreements among responding agencies as well as documenting casualties and property damage to settle later claims.

The *Logistics Section* is the support mechanism for the emergency response organization. This section oversees a variety of functions and establishes sectors (which operate at a tactical and task level) to execute its functions. Figure 9-1 shows four principal sectors under Logistics: Staging, Accountability, Rehabilitation, and Resources. Staging oversees the initial arrivals of unassigned companies (units). Accountability tracks the units and individual crews responding to an incident to insure their safety. The Rehabilitation Sector is responsible for the monitoring and care of deployed personnel, addressing both physical and psychological ability to function effectively. This sector uses specialized equipment and also provides food, fluids, and debriefing for personnel. Finally, the Resource Sector oversees all equipment and apparatus, provides any needed communications equipment, and handles repairs and resupply. In a hazmat incident, this sector will be responsible for supervising the movement of antidotes, other pharmaceuticals and medical supplies, and equipment from local jurisdictional caches to the scene.

In summary, the IMS is a flexible structure for organizing emergency response. Its value lies in the close linkage between emergency plans and emergency response operations. To adequately plan for a threat, it is imperative that the emergency response organization adapt to the specific demands of each incident. The IMS both reflects and directs the capabilities of the organizations that respond to the incident, so planning processes that account for the local IMS have greater flexibility and a greater likelihood of being successfully implemented in the field. The principal advantage of IMS over the earlier ICS is that it provides for a better accounting of the activities that must be performed away from the incident scene. For example, IMS explicitly addresses activities such as warning, evacuation, and mass care of victims that are not addressed within ICS. Unfortunately, these activities must all be addressed by the Operations Section. For example, an Evacuation Branch (staffed by either police or fire personnel, or both) would be established to coordinate the movement of people from risk areas adjacent to the scene and coordinate information releases to the public through the onscene PIO. However, this arrangement requires the Operations Chief at an incident scene to be responsible for branches or sectors that s/he cannot supervise directly (because they are in other locations). Moreover, assignment of these activities to the Operations Chief has the potential for violating the principle of manageable span of control if s/he must supervise warning, evacuation, and mass care branches in addition to transport, rescue, hazmat, fire, and medical branches. Unfortunately, there has been no empirical research on the effectiveness of IMS or ICS as an organizing mechanism for incident command. In part, this situation exists because there is no formally structured alternative command system to which it might be compared. There have been attempts to adapt the IMS more directly to EOCs, but these efforts have been descriptive rather than data based (Perry, 1995). Ultimately, the use of IMS rests upon the intuitive strength of the assumption that implementing the seven basic principles will yield more effective incident management.

Acquisition and Maintenance of Emergency Response Resources

To support the emergency response organization, emergency managers must acquire and maintain the resources needed for effective operations. This includes the construction and equipping of EOCs and the acquisition and maintenance of equipment.

Emergency Operations Centers

EOCs are facilities that provide technical assistance to emergency responders at the scene of an incident. EOCs, which are permanently located in areas expected to be safe from hazard exposures, provide support for the performance of emergency response functions at the incident scene. An EOC is important because the resources needed to respond to an incident are often widely dispersed, so the specific resources needed to respond to a particular type of incident at a given location cannot be predicted with certainty in advance. Moreover, many organizations participate in the incident response and each organization must have a capability for obtaining and processing timely information about the incident. This capability is established by collocation of essential personnel with telecommunications and information processing equipment in an EOC that will provide an effective division of labor while maintaining coordination of action. Lessons learned in previous incidents suggest that considerable decisionmaking authority should be allocated to organizations close to the incident site because of their superior knowledge of local conditions. However, greater technical knowledge and resources generally are available at higher levels. Thus, close coordination is needed among organizations at all levels.

A jurisdiction's EOC should be sited at a location that provides ready access by those who are essential to a timely and effective emergency response. This includes both those who have technical knowledge as well as those with policymaking responsibilities. In the case of a transportation incident, an IC establishes a Command Post at the incident scene and maintains regular communication with the local EOC (if necessary). In addition, the Incident Command Post directs the emergency response by coordinating the activities of field teams from the shipper or carrier with local government response teams such as fire fighters who are attempting to terminate the emergency and minimize population exposures.

An EOC must be designed with enough space to house to support the emergency response functions that take place within it. Moreover, it must provide a layout that places its staff in close proximity to the equipment, information, and materials they need. Previous guidance and practice (Federal Emergency Management Agency, 1984; Lindell, et al., 1982; US Nuclear Regulatory Commission, 1981) indicates EOC designers must perform the following tasks:

1. Establish the EOC design team.
2. Analyze the organization of the EOC.
3. Assess the flows of resources associated with each position.
4. Determine the workstation requirements for each position.
5. Assess the environmental conditions needed to support each position.
6. Determine the space needs for each position.
7. Develop a conceptual design for the EOC.
8. Document the design basis for the EOC.

During Task 1, a design team should be established that contains expertise from emergency preparedness, information technology, ergonomics, and architecture. The design team should interview representatives of all functional teams that will work within the EOC to obtain the information needed to develop the design basis. During Step 2, the design team should examine the EOP and its accompanying procedures to determine what are the functional teams into which the EOC is organized, the positions to be staffed within each team, and how the positions are related to one another. In addition, the design team should assess the flows of resources associated with each position—especially the flows of information. Static information such as EOPs, plant layouts, evacuation route locations, and air infiltration rates for local residential structures can be gathered ahead of time and stored for easy retrieval. Dynamic information about the status of hazard conditions (e.g., flood forecasts, hazmat facility conditions) must be collected from the appropriate sources, routed to those who need it, and processed quickly and accurately to support critical decisions. Both static and dynamic information can be conveyed in three different formats—verbal (words), numeric (numbers), or graphic (pictures or figures). The inherent difficulty in transmitting some types of information (especially graphic information) can combine with the volume of information transmitted (especially large tables of numbers) to severely strain the capacity of EOC staff to perform their functions unless advanced telecommunication technologies such as electronic mail and computer based information displays are used to manage the flow.

The flow of materials generally is not very significant unless paper is the medium by which information is conveyed. Similarly, equipment flows generally are minimal in dedicated EOCs although they can be significant if the EOC is located in a space that normally is used for another purpose (e.g., a conference room). However, flows of personnel are very intense during the EOC's initial activation and shift changes. Moreover, some positions require a considerable amount of movement. For example, many emergency organizations have analysis teams whose leaders link their teams with an Executive Team or Emergency Director (e.g., mayor or city manager), so the team leaders need to move back and forth between groups. Because of this frequent movement, EOCs must be designed to ensure the team leaders remain informed about events that take place in one group when they are with the other group, yet do not disrupt others as they move back and forth.

During Step 3, the Design Team should identify the workstation requirements for each position, especially for vertical storage space, horizontal workspace, and the number of personnel using them concurrently. It is advisable to provide seating and, in some cases, work surfaces, whose height can be adjusted readily to accommodate differences in workers' body dimensions. Similarly, keyboard heights and computer viewing angles also should be adjustable.

During Step 4, the Design Team should assess the environmental conditions needed to support each position. All positions within the EOC are likely to have similar needs for heating, ventilation, and air conditioning, but there can be significant differences in the need for lighting and noise suppression. Variation in lighting needs can be accommodated by providing locally controllable task lighting, and noise suppression can be achieved with acoustically absorbent material. During Step 5, the design team should determine the space needs for each position. The space needed for each position will be determined largely by the amount of horizontal workspace and also by the requirement for circulation space (the area needed for people to move about freely in the work area). Variation in the staffing needs for different types of incidents generally requires a design that provides flexibility in space allocation from one activation to another. In most cases, this flexibility can be provided by open space designs with moveable partitions between team areas.

During Step 6, the design team's architect can use the information flow to construct an adjacency matrix, which describes the degree to which each of the EOC teams needs to be located in close proximity to each of the other teams. The adjacency matrix, together with the information from the space analysis, can be used to develop an idealized layout. In most case, this idealized layout must be adapted to the physical constraints of an existing building in which the EOC will be constructed. During Step 7, the Design Team should prepare a design basis document that summarizes the results of their analyses and the resulting design. This document should be reviewed by those responsible for the EOC's operations and by a committee representing each team that will staff the EOC. This review will provide an opportunity for users to verify the accuracy of the design basis and to provide a benchmark against which subsequent proposals for EOC renovations can be assessed.

Equipment Acquisition and Maintenance

Each agency should identify the equipment it needs to perform its assigned tasks, paying special attention to tasks that are only performed during emergencies. Special purpose equipment that is not used routinely will require personnel to be trained and periodically tested in its proper use. In addition, such equipment might need periodic preventive maintenance, battery checks, and recalibration. An emergency manager should maintain a computer database of emergency-relevant equipment that is owned by the jurisdiction. To provide a capability for rapid search during an emergency, this database should contain fields listing the euipment's name, model and manufacturer, names and contact numbers for personnel authorizing release of the equipment, names, and contact numbers for qualified operators, contact numbers for repairs, and critical dates such as preventive maintenance, battery check, and recalibration.

EOP Development and Implementation

For many years, the federal government provided state and local governments with criteria for evaluating their EOPs. Some of this guidance was developed for specific hazards such as nuclear power plants and toxic chemical incidents whereas other guidance had an all hazards approach. The guidance for chemical hazards (National Response Team, 1987, 1988) appears to have been derived from the earlier guidance for radiological hazards (Nuclear Regulatory Commission/Federal Emergency Management Agency, 1980), but there are marked differences between the guidance for these two hazards, on the one hand, and the all hazards guidance on the other (Federal Emergency Management Agency, 1996b). Of course, no emergency manager wants to develop one EOP for chemical/radiological incidents and another EOP for all other hazards. Consequently, the presentation below attempts to integrate these two different sources of guidance for EOP development.

EOP Components

The Federal Emergency Management Agency's (1996) *State and Local Guide* (SLG-101) advocates structuring EOPs in terms of four basic components

- A basic plan,
- Functional annexes,
- Hazard-specific appendices, and
- SOPs and checklists.

Basic Plan

The basic plan should describe the EOP's

- Purpose,
- Situation and assumptions,
- Concept of operations,
- Organization and assignment of responsibilities,
- Administration and logistics,
- Plan development and maintenance, and
- Authorities and references.

The *purpose* states what the EOP is supposed to do and briefly summarizes the basic plan, functional annexes, and hazard-specific appendices. The *situation and assumptions* briefly reviews the information developed in the jurisdiction's HVA and describes any policies that limit the authority of the emergency response organization. The *concept of operations* provides a narrative describing the sequence of emergency response activities, beginning with activation upon notification of emergency conditions, continuing through hazard operations to combat the hazard agent and population protection activities to save lives, and ending with deactivation upon termination of the emergency. The *organization and assignment of responsibilities* describes the structure of the emergency response organization and explains which agency, NGO, or private sector organization is responsible for each emergency response function. The *administration and logistics* section describes policies for expanding the emergency response organization through mutual aid, and incorporation of volunteers. It also addresses policies for identifying resource needs, expedited acquisition of additional resources, tracking resources allocation, and payment or other compensation. The *plan development and maintenance* section defines the provisions for reviewing, exercising, and updating the EOP. The *authorities* *and references* section addresses the legal and administrative basis for the EOP and refers the reader to other documents, such as the HVA and departmental SOPs for further details.

In addition, the first page of every plan should contain the date of the original plan and the dates of all plan revisions arranged chronologically. Typically, copies of EOPs are provided to multiple offices and organizations (some inside and some outside a jurisdiction). Emergency managers must ensure all people and organizations on the plan distribution list have the most current version of the document.

Functional Annexes

The definition of the functional annexes is a problematic aspect of writing an EOP. SLG-101 lists direction and control, communications, warning, emergency public information, evacuation, mass care, health and medical, and resource management as the eight core functions that emergency response organizations perform. This appears to be a reasonable list but, as Table 9-4 indicates, it is inconsistent with federal guidance for nuclear power plants (NUREG-0654) and chemical incidents (NRT-1). Moreover, as will be discussed later, the core functions proposed in federal planning guidance are inconsistent with the basic functions defined in the Incident Command System and Incident Management System. Fortunately, local jurisdictions still retain the authority to decide how they will define these emergency response functions in their EOPs. Thus, a jurisdiction can organize its EOP in the way that is most compatible with its normal organizational structure. Nonetheless, local jurisdictions that favor the NUREG/NRT function definitions will tend to be most compatible with the emergency response organizations for nuclear power plants and chemical shippers and carriers. Similarly, local jurisdictions that favor the ICS/IMS function definitions will have the greatest compatibility with external fire and law enforcement agencies providing support under mutual aid agreements.

Whatever typology a jurisdiction uses for defining its EOP annexes, the set of annexes must collectively address all disaster demands. Thus, the emergency manager must provide coordination among those writing the annexes. It is especially important for those who must implement an annex to be the ones who write it. In most cases, a single organization will have responsibility for an entire annex (e.g., the fire department will write the fire annex), but multiple organizations may need to collaborate in other cases (Mass Care). Each annex should address the federal Emergency Support Functions (ESFs) from the National Response Plan that would be expected to provide support to that annex (see the appendix at the end of this chapter).

Hazard-Specific Appendices

Hazard-specific appendixes provide information about the ways in which the response to a particular hazard agent differs from the standard response to community emergencies. It is important to avoid confusing specific types of threats (such as terrorist attacks) with general emergency response functions. Terrorist attacks can involve any one of four types of hazard agents—flammables/explosives, chemicals, nuclear/radiological materials, or biohazards. Each of these is a specific hazard that will require substantial adjustments to some emergency response procedures (e.g., emergency assessment) and much smaller adjustments to others (e.g., incident management). Thus, terrorist attacks should be addressed in hazard-specific appendixes, not functional annexes.

SOPs and Checklists

SOPs and checklists describe the steps that individuals and organizations will take to perform specific emergency response tasks. Some of these may be included in the EOP whereas others may simply be referenced.

Training and Exercising

All personnel who are expected to participate in the jurisdiction's emergency response need to be trained to perform their assigned tasks. In addition, they should participate in periodic refresher training to ensure their knowledge and skills remain current. In general, the highest priority should be given to tasks that are *infrequent, critical,* and *difficult to perform*. Training is needed for infrequently performed tasks because people's knowledge and skill decay over time. Training is needed for critical tasks because the cost of an error is high. Training is needed for tasks that are difficult to perform because these are the ones for which skill decay is most rapid. There is increasing recognition that people must be trained to perform both taskwork and teamwork (Cannon-Bowers & Salas, 1998; McIntyre & Salas, 1995). *Taskwork* involves the performance of positional duties. For example, a hazmat technician must be trained to don personal protective equipment, patch and plug leaky containers, replace defective valves, and conduct decontaminations (in addition to many other tasks). Training for taskwork usually involves cross-training to develop interpositional knowledge (teaching one team member how to perform another team member's job) and explaining the emergency response organization's overall concept of operations to all emergency responders.

Another consequence of the infrequent occurrence of disasters is not possible to evaluate emergency responders' performance frequently. Accordingly, emergency management agencies schedule periodic drills and exercises to test performance and critiques to provide feedback. These topics will be discussed more completely in Chapter 12.

Table 9-4. Typologies of Emergency Response Functions.

Organizational Functions	Organizational Subfunctions	NRT-1 Functions	ICS Functions	Local Plan Annexes
Emergency assessment				
	Threat detection/emergency classification	Ongoing incident assessment		
	Hazard/ environmental monitoring	Ongoing incident assessment	Planning	
	Population monitoring and assessment			
	Damage assessment			Recovery
Hazard operations				
	Hazard source control	Containment and cleanup	Operations	Firefighting *or* Fire/rescue; Hazmat/Oil spill
	Protection works	Public works	Operations	Public works/ Engineering
	Building construction		Operations	
	Contents protection		Operations	
			Operations	Utilities
Population protection				
	Protective action selection			
	Population warning	Warning systems and emergency public notification		Warning
	Protective action implementation	Personal protection of citizens		Evacuation/ Transportation; Radiological protection
	Impact zone access control/security	Law enforcement		Law enforcement
	Reception/care of victims	Human services		Shelter/Mass care; Human services
	Search & rescue	Fire and rescue		Search & rescue
	Emergency medical care	Health and medical		Health/Medical services
	Hazard exposure control	Response personnel safety		
Incident management				
	Agency notification/ mobilization	Initial notification of response agencies		Warning
	Mobilization of emergency facilities/equipment		Planning	
	Communication/ documentation	Responder communications		Direction & control
	Analysis/planning		Planning	
	Internal direction & control	Direction and control	Command	Communication

	Public information	Public information/ Community relations	Command	Emergency public information
	Finance/ administration	Resource management	Planning; logistics; finance/admin	Resource management
	Logistics		Logistics	Donations management
	External coordination	Direction and control	Command	
				Legal

Emergency Preparedness by Households and Businesses, and Government Agencies

Research on household emergency preparedness has been conducted on a variety of hazard agents (especially earthquakes and hurricanes) and has yielded consistent findings across studies that have been summarized recently in the Protective Action Decision Model discussed in Chapter 4. Specifically, there is evidence that people have become increasingly aware of hazard mitigation and emergency preparedness actions they can take to protect themselves from environmental hazards (Lindell & Perry, 2000), but awareness of hazard adjustments does not imply accuracy of risk area residents' beliefs about them. For example, Kunreuther, et al. (1978) found most non-policyholders who were aware earthquake insurance coverage was available could not provide an accurate estimate of its cost. A quarter of them were unable to give *any* estimate of the premium and most of the rest overestimated premium rates (see also Palm, Hodgson, Blanchard & Lyons, 1990).

Information derived from others is important because disasters occur so infrequently that it is difficult to learn by trial and error from personal experience. Researchers have examined two sources of social influence—peers (friends, relatives, neighbors, and coworkers) and the mass media—and found evidence that both types are associated with seismic adjustment. In particular, Mileti and O'Brien (1992) found adoption of seismic adjustments immediately after the Loma Prieta earthquake was significantly related to information quality (specificity, consistency, and source certainty) and information reinforcement (number of warnings). Similarly, Mileti and Fitzpatrick (1992) found significant effects for frequency of information receipt, message specificity, and source consistency in their study of the Parkfield prediction. More recently, Mileti and Darlington's (1995, 1997) study of the effects of a hazard awareness campaign in the San Francisco Bay area found that respondents had engaged in a large number of seismic adjustments. Many of these were adopted before the campaign, but even more were undertaken in the following year. For example, emergency equipment storage rose from 50% to 81%, food and water stockpiling increased from 44% to 75%, and earthquake insurance purchases went from 27% to 40%. Mileti and Darlington (1997) reported adoption of these and other adjustments was positively correlated with the number of information channels and the presence of response guidance.

Emergency preparedness by businesses and government agencies suffers from many of the same limitations as was observed among households. Environmental hazards have low salience until an imminent threat arises, so emergency preparedness (and hazard mitigation) must compete with routine demands for space on the organizational agenda. This tendency is especially pronounced in organizations with limited financial assets. Generalizing from research in the broader literature on implementation indicates emergency preparedness programs are difficult to implement because emergency management tends to be viewed as an intractable problem; disaster reduction policies lack clear and measurable performance objectives; jurisdictions have insufficient resources; public and official support is minimal; and higher levels of government fail to provide sufficient emergency management guidance to local jurisdictions (Waugh, 1988).

A basic problem is that only a very few organizations are specifically evaluated on their preparedness to continue operations after disaster strikes—known as *continuity of government (COG)* and *continuity of operations (COO)*. COG deals with the measures that assure government survives during and after a disaster—the survival of the basic elements of the executive, legislative, and judicial branches of government. COO addresses the measures ensuring organizations can deliver essential services during and following a disaster. In the case of government, this includes services such as tax assessment, official records, and human services. Few organizations prepare for the need to continue operations following disasters when they are called upon to meet "normal" demands (Anthony, l994; Cooke, l995; Wolensky & Wolensky, l990). As with households, disaster is only a vague threat that "ought to be addressed someday" when more resources are available.

Federal agencies and the federal government are required by statute, Presidential Decision Directive 67, and Executive Order 12656 to establish both continuity of government and continuity of operations plans. Federal Preparedness Circulars 65, 66 and 67 (www.app1.fema.gov/library/ libfpc_a.htm) lay out specific guidance for executives and emergency planners regarding plan development and content, training and exercise requirements and the acquisition of alternate facilities for continuity of operations. The US General Services Administration (2002) maintains a COO plan template (www.gsa.gov) for use by federal planners.

COG and COO plans both have nine major elements:

- Concepts of operations are guided by the jurisdiction emergency plan.
- Essential functions are identified and prioritized.
- Unambiguous lines of succession for executives are specified.
- Authority delegations and emergency decision-makers are predetermined.
- EOCs and alternate work facilities are identified.
- Interoperable communications are established.
- Security is enhanced for personnel, facilities, and critical resources.
- Vital records and databases are protected.
- Schedules of training and exercises are maintained.

Comparatively little research attention has been devoted to COO preparedness among agencies lacking emergency response functions (Lindell & Meier, l994). Virtually all of the existing research on such agencies has been conducted on municipal and county organizations. Three factors have been consistently identified as correlates of COO preparedness, the first of which is organizational size (Quarantelli, 1981a; Quarantelli, 1984). The explanation for this correlation is larger organizations have more resources and are also likely to have a greater perceived need for strategic planning, (Gillespie & Streeter, 1987; Banerjee & Gillespie, l994; Lindell, et al., l996a). Second, the level of perceived risk among organizational and department managers is positively correlated with emergency preparedness (Mileti, l983, Mileti & Sorensen, l987; Drabek, l990). Finally, the extent to which managers report seeking information about environmental hazards is positively correlated with organizational preparedness (Lindell, et al., l996a; Barlow, l993; Stallings, l978). Perry and Lindell (l997c) assembled these factors into a model predicting earthquake preparedness by municipal and county departments. The three variables ultimately explained about two thirds of the variance in earthquake preparedness, with risk perception and self reported information-seeking behavior being the most important of the variables.

FEMA (no date, c) has developed an *Emergency Management Guide for Business & Industry* that outlines a COO planning process, identifies critical corporate emergency management functions, provides information about a variety of hazards, and lists sources to contact for further information. However, few research studies have examined the degree to which businesses have implemented the recommended activities and most of that research focused on limited samples of organizations. For example, Drabek (1991c, 1994a, 1994b, 1994c) studied tourist oriented firms, whereas Whitney, Dickerson, and Lindell (2001) studied hospitals, and Quarantelli, et al. (1979), Gabor (1981), and Lindell and Perry (1998) examined hazardous materials handlers. It is only more recently that researchers have conducted research on large, representative samples of business organizations (Dahlhamer & D'Souza, 1997; Mileti, et al., 1993; Nigg, 1995; Webb, Tierney & Dahlhamer, 2000, 2002).

The available research shows businesses display limited levels of COO preparedness. Drabek (1994a) found only 31% of the businesses in his survey of 185 tourist oriented firms had adequate levels of evacuation preparedness. Fewer than half of the businesses Mileti, et al. (1993) interviewed in the San Francisco Bay Area had developed emergency plans, trained employees, and conducted drills—despite this area's experience in the Loma Prieta earthquake only a few years earlier. A study conducted in Memphis and Des Moines found low levels of business emergency preparedness—businesses in Memphis had implemented an average of only 4 out of 17 recommended preparedness activities and those in Des Moines had implemented an average of only 1.7 out of 13 measures (Dahlhamer & D'Souza, 1997).

As is the case for government agencies, the most consistent variable predicting business emergency preparedness is organizational size. The Quarantelli, et al. (1979) study of chemical companies reported larger companies had more extensive planning processes than smaller ones, a finding replicated in Lindell and Perry's (1998) study of Los Angeles hazardous materials handling firms following the 1994 Northridge earthquake. Increasing size was also associated with evacuation planning in tourist oriented firms (Drabek, 1991c, 1994a, 1994b, 1994c) and Dahlhamer and D'Souza (1997) reported a positive correlation between size and preparedness.

As is the case for households, there does seem to be a positive relationship of disaster experience with business emergency preparedness (Dahlhamer & Reshaur, 1996; Dahlhamer & D'Souza, 1997; Webb, Tierney & Dahlhamer, 2000). In addition, other organizational characteristics such as business age, scope (local vs. national) and type have also been found to correlate with emergency preparedness, but the findings across studies are inconsistent.