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FEEDBACK FROM THE FIELD

INCORPORATING MILITARY CIVIL AFFAIRS SUPPORT INTO DOMESTIC DISASTER MANAGEMENT

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Internationally, the military—by virtue of its readiness status, ability to launch large-scale operations, and possession of specialized personnel and equipment—has almost always responded to community disasters. Especially with the growth of a professional emergency-management cadre, through such organizations as the National Coordinating Council on Emergency Management, it is very important to connect the military and civilian sides of emergency management more closely. This paper describes the structure and operation of Civil Affairs programs in the military and considers ways in which community-emergency managers can connect with such programs.

Disasters are events that virtually by definition overwhelm the capacity of a local social system to sustain itself without some form of organized outside help. Events such as Hurricane Andrew, the eruption of Mt. Pinatubo volcano, the Los Angles earthquake, and the Midwestern U.S. floods, underscore the demands that can be placed on communities both by the disaster agent itself (natural or technological) and by the need to mount response and recovery operations to the event. In the United States, there is growing concern—certainly on the military side—that civilian and military resources be systemically coordinated and deployed in response to disaster events as a means of achieving optimum protective outcomes for citizens. This requires knowledge of civilian-emergency management on the part of military officials, and equally importantly, it requires that knowledge of the military side be disseminated to civilian-emergency officials. The purpose of this article is to begin the process of sharing a detailed view of the civilian-operations side of the military, with particular attention to the statutory bases of such operations and their integration into the larger federal disaster-management community.

Domestic disaster-relief operations use Department of Defense (DOD) personnel, equipment, and supplies to promote human welfare, reduce pain

and suffering, and prevent loss of life or destruction of property from the aftermath of natural or manmade disasters. In domestic disaster situations, the coordination of the response is through the direction of the Federal Emergency Management Agency (FEMA) under the *Federal Response Plan* for Public Law 92–228. As a supporting agency to the plan, the US Army is the DOD executive agent. The ability of the Army to deploy rapidly, and its capability to operate in the most austere environments make it ideally suitable for this mission.

The statutory authority for federal domestic disaster-relief operations is the *Robert T. Stafford Disaster Relief Act*, 42 USC 5121. It provides for the declaration of an emergency or disaster by the President and describes the amount and type of federal assistance available. The Stafford Act authorizes the President to use DOD assets for disaster relief once a formal declaration is made. The policy for implementing domestic disaster assistance, as outlined in the Stafford Act, is DOD Directive 3025.1, Military Support to Civil Authority and Department of the Army Regulation 500–60, Disaster Relief.

The fundamental principle for employing military resources is recognizing that the civil government has the primary authority and responsibility for disaster assistance within its respective jurisdictions. The National Guard has the primary responsibility for providing military domestic disaster assistance within its respective state. The federal domestic disaster declaration can be invoked for any event whose severity or magnitude overwhelms the capability of the local and state authorities to respond to the situation or where the disaster area covers multiple state boundaries.

In a disaster situation, the military role is well-defined and by law is limited in scope and duration. Military resources temporarily support and augment, but do not replace, the local, state, and federal civilian agencies that have primary authority and responsibility for domestic disaster assistance. Domestic disaster-relief operations are normally conducted in stages: response, recovery, and restoration. The military role is most intense in the response stage and steadily decreases as the operation moves into recovery and restoration. The military withdraws when the civilian authorities have regained the capacity to provide basic services to the affected community.

When a disaster has occurred, assessing the potential or real damage and the anticipated military-support requirements must precede the commitment of military resources. This assessment is usually shared by federal, state, local, and military agencies. This insures the commitment of resources and forces will be appropriate for the mission and that they will be used efficiently. The US Army Civil Affairs units are mission tasked to prepare for and conduct disaster-relief operations and assistance to civil authorities

in both domestic and foreign situations. As a US Army Reserve (USAR) element of Special Operations Command, civil affairs offers unique skills and abilities to the overall aspect of disaster-relief operations. As a reserve-component element, it relies on its citizen-soldier status to understand and empathize with the political, economic, and social aspects of an affected community which may not be as well appreciated by an active-duty-component element. A civil affairs unit is designed to be the interface between the military and civilian agencies in the disaster area. The military assists the civilian community help itself recover from the disaster and reestablish basic services to its citizens. Civil affairs units advise the military commander on the impact of military activities on the civilian sector. They assess damage to the civilian infrastructure, assist in operating temporary shelters, manage a Civil-Military-Operations Center (CMOC) , and provide a liaison among the military and the various civilian governmental, nongovernmental, and private relief organizations. Also, as a USAR unit, it is not bound by individual state statutes or regulations which would limit the scope of a nonfederalized National Guard unit in a multistate disaster situation.

Currently in place is doctrine to use US Army Civil Affairs units to assist in preparing and conducting disaster-relief operations. In most cases, however, civil-affairs units are not effectively used to conduct their assigned mission because they are located in the reserve components. Civil-affairs units have been an underutilized or *not even utilized* in the past for missions which are directly related to civil-affairs operations. Many after-action reports have stated that civil-affairs units need to be in the initial deployment forces. Historically though, civil-affairs units have been brought into action in the later part of the cycle. Many missions within the realm of civil affairs seem to be tasked to active-component-infantry units out of convenience.

Today, with downsizing of US military forces, there is a greater need for more effective utilization of reserve-components for viable missions instead of tasking the active component. There is a need to better utilize civil affairs, specifically, to perform roles that clearly fall within their mission and scope. Humanitarian assistance, disaster relief and support to domestic authorities are ways to accomplish these goals. The long-term survivability of civil affairs as a functional segment of the overall reserve-component force is directly related to the better utilization of these unique citizen-soldier assets to meet both foreign and domestic disaster-relief needs of the United States.

The biggest hurdle to deploying USAR units in response to domestic or foreign disasters is the National Command Authority's reluctance to mobilize reserve-component units except in a major crisis situation such as

Operation Desert Shield/Storm. Under current law, Federal Reserve component personnel can be mobilized for domestic disaster-relief operations under two statutes; 10 USC 672(b) which covers 15 days of Annual Training (AT) and 10 USC 672(d) which covers volunteers. In a disaster-relief operation, these statutes have proved to be both inadequate and unresponsive. The United States can not continue to rely on "volunteer" support for these emergencies. Volunteers, in the past, have provided the greatest level of support when called upon, but continued reliance on the volunteer system violates our doctrine of deploying trained units to meet mission requirements. Relying strictly on volunteers does not insure that the best trained or most-prepared soldiers are utilized—only those who may be available at any given time. Gathering numbers of volunteers together into a provisional unit requires stand-up time for personnel to learn the jobs and work together as a functioning team. This is not the most efficient or effective manner to employ these assets, especially in time-sensitive, emergency or disaster-relief operations.

If Title 10 USC is amended to allow for a "25K Call-Up" for humanitarian-assistance missions and/or domestic disaster-relief operations, Civil Affairs Detachments, Battalions, or Brigades could deploy from home station via military airlift or self-deploy using organic transportation to the disaster area. As units, they already have an existing chain-of-command, a communications-coordination network, equipment with trained operators assigned, standing operating procedures (SOPs), and experience (based on their training program) to function as effective units in the disaster-relief/humanitarian-assistance situation. Since their mobilization and employment would be for the stated purpose of providing humanitarian assistance and relief, in most cases, the immediate response periods will usually not exceed 30 days, therefore, the individual Reservist probably would not be in jeopardy with their civilian employer as previously feared. During the response to Hurricanes Hugo, Andrew, and Inilki as well as the major winter storms and floods in the past few years, the outpouring of support from within the local communities to aid those in need has been overwhelming. This support should translate to political authority allowing the President or Secretary of Defense to mobilize USAR soldiers for large-scale disasters, while their use in some low-intensity conflict situation (such as Somalia and Bosnia) may not be as palatable. By using the mobilization authority instead of relying on volunteers, the "25K Call-Up'" would protect the Reservist or Guardsman just as any other mobilization statute. How better to "sell" the importance of the Reserve Components than to employ them to support people in need, especially for domestic emergencies!

Several training and operational recommendations need to be addressed to better utilize civil-affairs units to meet humanitarian-assistance and disaster- relief training and mission-oriented operations within the United States as well as overseas. Civil-affairs soldiers must effectively coordinate their efforts with those of the American Red Cross and the Federal Emergency Management Agency (FEMA)—the primary civilian agencies tasked to provide humanitarian assistance and domestic relief in the United States. Three recommendations to better prepare for actual emergency or crisis operations are: standardized disaster-/emergency-management training programs for resident and nonresident instruction; a training, coordination, and operations association between the military and civilian agencies; and a way to deploy and employ reserve-component civil-affairs elements quickly to provide foreign and domestic humanitarian assistance or disaster-relief support.

Standardized Training Program

The military element with the explicit mission of preparing and conducting humanitarian assistance and disaster-relief operations is civil affairs. One of the missions of Civil Affairs Commands, Brigades, and General Purpose Battalions is to plan and conduct humanitarian assistance, disaster relief, noncombatant evacuation, and displaced-civilian operations in a theater of operations and to train other governments to be able to support their citizen's needs by developing disaster-response plans. Civil-affairs soldiers have an additional skill identifier (ASI) to designate those trained or with specific experience in disaster or emergency services through working with FEMA, the Red Cross, or similar relief agencies. Civil-affairs soldiers provide the link among the military and the civilian government or agency. FM 25–100, *Training the Force*, and various training-support literature stress the importance of training on a task in the same manner as the task is to be executed—train as you will fight. In the humanitarian-assistance/disaster-relief arena, the best way to train to perform the task during an emergency situation is to train on the respective task or tasks during scheduled training periods. There is no standardized training on these subject areas in the military training system. Where does the military go to get training-support packages—to the American Red Cross and FEMA! Other relief agencies' training-support systems are also available, but the Red Cross and FEMA systems best meet the military's need for a standardized, distributable-training package.

The Red Cross and FEMA provide several training programs in emergency management and disaster services to the civilian population. These are standardized, nationally approved training programs targeted to those

persons responsible for domestic emergency actions at the local, state, and national level. These same training programs parallel the ARTEP mission-training plans for civil-affairs units from the Command to the Detachment level. There is no need to "reinvent the wheel" in developing training programs for the military to perform humanitarian missions when the civilian "experts" already have a viable, no-cost system in place.

A two-phased training program can be established using these existing programs. The FEMA Home Study Program provides an overview of emergency management and obligations. These correspondence courses provide training in a group or individual study manner and an excellent foundation for more "hands-on" instruction, which the Red Cross disaster-services-training program provides. These courses, taught in a resident or classroom setting by certified Red Cross instructors, cover basic-, intermediate-, and advanced-level instruction, to include staff exercises, based on the needs of the audience. Many of the instructional programs are 4, 8, or 16 hours long. Since 97 percent of the civil-affairs units are assigned to the reserve components, this fits their Inactive Duty Training (IDT)—weekend mode—or can be combined into a standardized, two-week AT period. This training not only provides mission-essential task-list (METL) training to the civil-affairs units but also a trained manpower pool from the "citizen-soldiers" in the various local communities for the local Red Cross Chapters to use as volunteers in case of emergencies where reserve-component units are not mobilized.

Much of the civilian-oriented disaster-services training fits into the types of military-oriented activities civil-affairs units do on a routine basis. Planning for all military operations always begins with an estimate of the situation. Training in damage-assessment procedures teaches the soldiers how to conduct a standardized assessment and put this assessment into a series of reports that will help develop a plan or course of action for the relief effort. Mass-care operations train the soldiers to organize or set up emergency shelters and mass feedings for large numbers of displaced persons or evacuees. The military has always been proficient in sheltering and feeding large numbers of military personnel in both garrison or field conditions and providing for their comfort, health, and welfare. In emergency mass-care situations, the military unit shelters, feeds, and provides for the needs of displaced civilians versus soldiers.

Training in assistance to families teaches soldiers how to interview people affected by a disaster and assist them in meeting their immediate and long-term needs. This is very similar to the interview processes during a soldier's unit in-processing, birth-month personnel audits, and processing-for-overseas-movement (POM) activities. Since the majority of the

civil-affairs soldiers are citizen-soldiers, they are more familiar with the various civilian support agencies and their respective operations and can better direct those in need to relief sources. Active-component soldiers can provide similar assistance in a disaster, but since most active duty family support in similar situations comes from installation or military-oriented providers, they may not be aware of comparable civilian agencies.

The training received through the Red Cross and FEMA opens the lines of communication between military and civilian agencies. FM 100–19, *Domestic Support Operations*, emphasizes the importance of mutual understanding, communication, coordination, and liaison between military and civilian agencies as a key to success in providing effective and efficient domestic emergency response or support. This understanding will allow for an easier transition into working together during actual emergency situations because all agencies in the disaster response have a level of appreciation for the other's goals, objectives, and methods. Therefore, the better each responding agency works with its counterparts, the quicker and more efficiently any disaster assistance will be provided to those in need.

Training and Operational Association

One of the successes in preparing reserve-component units to be combat ready is the Directed Training Association (DTA) program. It is outlined in FORSCOM Regulation 350–4, *Training Under Capstone*, and links similar type reserve- and active-component units in a training-support association. The active-component unit provides the trainers and their respective knowledge and experience to train their reserve-component counterparts. This program is designed to raise the level of training readiness of the reserve-component unit and its soldiers in meeting their wartime mission. The DTA-aligned units may not have been in the same wartime chain-of -command or "Capstone trace," but the spirit of the program was to insure trained and ready forces, while at the same time show the active-component soldier the capabilities of their reserve-component "brothers-in-arms."

A similar program can be established for Civil Affairs Brigades, Red Cross, and FEMA Regions. Currently there are nine Civil Affairs Brigade Headquarters, eight Red Cross Regions, and ten FEMA Regions which can be grouped into training and operational associations to provide disaster-relief assistance within specified geographical areas. These associations would be established so that the training assistance from either or both civilian agencies would be provided to the civil-affairs partner. Such training would include classroom instruction, drills, and training exercises at various levels (i.e., the respective subordinate units or elements of these agencies). This would support a Civil Affairs Battalion or Detachment

training with their local Red Cross Chapter or local emergency-management agency. Since operational- and contingency-plans development and review are a mission requirement of all agencies, the civil-affairs unit and its soldiers could assist the local chapters and field offices in reviewing and developing emergency-response plans to meet the needs of their respective communities or areas of responsibility. This fits well into the civil-affairs mission task of assisting local, state, and national level governments in their respective operational theater. In this manner, civil-affairs soldiers get the necessary training and experience through supporting their local agencies, including providing humanitarian assistance overseas; while at the same time, the Red Cross and FEMA get additional support in meeting their mandates. This allows the civil-affairs unit to train effectively to meet its "wartime" or METL task under nation-assistance overseas by providing domestic assistance at home.

When an emergency occurs, the Civil Affairs Brigade Headquarters would be alerted when their respective Red Cross and/or FEMA region is alerted. The Civil Affairs Brigade would coordinate the deployment of its subordinate battalions to assist in the emergency response. The emphasis would be on employing at the lowest level of response needed, but with the capability of expanding as the need arises. If the situation elevates to the point of employing large military units to provide disaster response (such as after Hurricane Andrew), the Civil Affairs Brigade could provide the necessary liaison between the military commander and the various private volunteer organizations and nongovernmental organizations. In this manner, all of the available assets for disaster response can be quickly brought together to alleviate the suffering.

Civil Affairs Quick-Reaction Team

A Civil Affairs Quick-Reaction Team should be established in Civil Affairs Battalions or Brigade Headquarters. This team would be trained and the necessary equipment on hand and prepared for deployment within 12–18 hours. The key to this concept is to identify, train, and prepare this Quick-Reaction Team just like an active-component unit. Many Civil Affairs Battalions and Brigade Headquarters have a majority of their unit members within one hour's commute of the Reserve Training Center or home station location. The individual soldier's equipment is usually stored at the Reserve Center as well as the bulk of the unit's assigned or TO&E equipment. Once the personnel are identified as team members, they would receive an official letter of notification to give to their respective civilian employers in advance of an actual mobilization order. This advance-alert notification insures that the employer understands the urgency of the

reservist leaving work with little or no-notice in the event of an emergency situation.

The Quick-Reaction Team would have received the necessary training to perform disaster response or other related humanitarian missions. This training would include military-related subjects, emergency medical or first aid training, disaster-operations procedures from existing civilian or non-governmental agencies such as FEMA, Red Cross, and Salvation Army, and strategic-communications procedures. They would have been processed in accordance with FORSCOM Regulation 500–3–3, with only the final personnel actions held in abeyance until actual mobilization. All other requisite preparation for deployment would have been accomplished in advance, such as weapons qualification, APFT, HIV, and immunizations. The higher headquarters would periodically inspect or exercise the team to validate their readiness in advance of a mobilization order. The team's equipment could be prepackaged or prepared in a manner to facilitate quick loading. This would include prepositioning air load items or other blocking, bracing, tie-down items as needed. Necessary supplies, such as food (Class I), fuel (Class III), medical supplies (Class VIII), and repair parts (Class IX), could be preloaded and secured in the battalion, separate from the remainder of the battalion's operational equipment and supplies. Periodic inspections of the individual and team equipment would be performed to rotate supplies and to validate the team's readiness for immediate deployment. Vehicle and personnel manifests for USAF or other carriers would be set up in advance and inspected or "quality checked" to save time. Upon notification through the command channels, the team members would implement their alert roster to assemble at the requisite time and place. The Full Time Unit Support (FTUS) personnel would begin the assembly and load out process while the reservists begin to assemble. Transportation to the emergency site would be coordinated through the US Transportation Command and the team would be given the load and "wheels-up" times. The team members would finalize their mobilization or active duty call-up procedures and be ready to load the equipment on aircraft or road march to the disaster site if appropriate. The FTUS personnel would then access the mobilized reservist into the active duty personnel system at the closest entry computer terminal while the team is heading to the disaster location. This allows the soldiers to move to the disaster site quickly without having to go from home station to a mobilization site en route.

The civil-affairs team can be deployed at the disaster site quickly, thereby avoiding the slower mobilization process currently in effect. Once on the ground at the site of the emergency, the Quick-Reaction Team would coordinate its efforts with the civilian relief agencies or governmental

officials, then provide an assessment to their chain-of-command which could identify the need for follow-on units, especially by type or function, that would best serve the needs of the specific situation. The Quick-Reaction Team could also be the advance party for the remainder of the Battalion/Brigade which could mobilize and deploy under the current FORMDEPS system.

Conclusion

Civil-affairs units have a great deal to offer the National Command Authority in meeting both the domestic and foreign needs of the US. Because of their unique citizen-soldier's knowledge, skills, and abilities, they can bring more civilian-related capabilities and experience to bear, than active-component units, in certain circumstances. The Total Force Policy would be better served if active-component units were used for missions for which they are trained, while reserve-component units were used for such short-term humanitarian or disaster-response missions. The civil-affairs units' ability to provide humanitarian assistance is directly related to the training and operational experience gained through a working partnership with the Red Cross and FEMA. This partnership in domestic situations translates into related skills and abilities in working with comparable local, regional, national, or even international relief agencies in foreign humanitarian-assistance missions.

This paper has sought to offer several ways to better prepare civil-affairs units to meet their mission training requirements, to develop ways to better employ these trained units to alleviate human suffering (both for foreign and domestic emergency situations), and to better utilize reserve-component forces during a period of downsizing the overall US military force and shifting missions within the total force. Civil affairs can be an important "combat multiplier" as well as an economy-of-force element in many missions of the emerging "Operations-Other-Than-War" (OOTW) situations the military is now facing. As the requirements and the missions within the spectrum of OOTW become more frequent, civil affairs should be integrated into these operations as early as possible and in a way to best utilize their skills and abilities. Through linking civil affairs and the civilian agencies charged with domestic humanitarian actions, the best interests of the United States can be achieved. Using these unique capabilities of civil affairs supports the US national strategy and its respective military strategy as the United States continues in its role as a world leader through its ability to deploy quickly and employ trained military forces anywhere in the world. Now these forces are seen as a national resource in filling humanitarian roles as well as operating in purely military situations.

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Technology, Structure, and Culture in Disaster Management: Coping with Uncertainty

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This paper will concentrate on three aspects of disasters which are often interwoven, but that require careful refinement and elaboration to understand how they interact in disaster situations. These are the technological, structural, and cultural dimensions of disaster events. These three dimensions will be superimposed and illustrated with respect to technical, sociopolitical, and scientific issues which have been identified as important components of disaster management. It is argued that the notion of uncertainty, when present in the management context, is related to the dimensions of technology, structure, and culture. The framework developed draws upon and is used to conceptually interconnect studies of Canadian disasters, as well as disaster events from other parts of the world.

When a disaster strikes, the response mounted by disaster managers is designed to put new order into the chaos generated by both the impact itself and the demands imposed by responding to the event. In this context, one can define disaster as a sudden, low-probability event with severe consequences in terms of losses for a community (especially in human, material, and financial terms). In most cases, a disaster brings—and the atmosphere of response is characterized by—uncertainty. This uncertainty is related to the technical, sociopolitical and, sometimes, scientific issues of a disaster (Denis 1991).

One can also understand these technical, sociopolitical, and scientific issues associated with uncertainty in the broader context of their relationship to technology, organizational culture, and structural design. These dimensions of society bear upon the way a disaster, and the associated uncertainty, are defined and dealt with, but they are not often recognized. Even when they are recognized, they are often confounded or mixed up. It is important to separate analytically and describe the components because they represent not only distinct dimensions, but the study of each lies in different scientific disciplines or realms.

Technology is probably the best defined of the three, as well as the most concrete; it can be reflected in such matters as equipment purchases and

engineering expertise. Organizational design involves management decisions about responsibilities, both at the organizational and megaorganizational levels (Denis 1995a). As a result, the time-frame in which one understands organizational structuring is much longer than for technology. Finally, culture addresses more profound human issues such as perceptions, values, and beliefs.

Uncertainty

Research on disaster management in Canada (Social Sciences and Humanities Research Council of Canada, grant number 1859–91–1333) has been conducted by the author. This study isolated three critical aspects that bear upon the way in which disaster events are managed. These are:

1. Technical Issues. These matters deal with requirements stemming from the disaster itself (sometimes called "agent-generated demands"), such as firefighting and search and rescue.
2. Sociopolitical Issues. These matters deal with requirements associated with responding to the disaster (sometimes called "response-generated demands") such as evacuation, mass care and shelter, communications, and the necessary relationships with elected representatives that any disaster involves.
3. Scientific Issues. These matters are related to the state of scientific knowledge, and its development and application relative to the source of threat.

In order to better illustrate our results, other case studies of disaster around the world were added to the research. It is thus the addition of our research results plus various case studies that constitutes the foundation of this article.

The three types of issues are complex and sometimes contribute to the level of uncertainty present in the disaster-response setting. The concept of organizational uncertainty has been previously utilized (Denis 1990a), drawing on the work of Crozier (1963), Thompson (1967) and Lawrence and Lorsch (1967). In this perspective, complexity refers to the presence of a large number of elements in a given problem, which may interrelate or interact in many combinations and permutations (Perrow 1984) making them difficult to grasp intellectually. Uncertainty may be understood in terms of a serious incapacity of disaster responders to solve a problem. Uncertainty arises in relation to a given event or problem; it is the condition created when the individual manager grasps the problem but lacks the knowledge or resources to overcome the challenge.

In situations characterized by high levels of complexity but low levels of uncertainty, the problem can be solved within a reasonable amount of

time within the available knowledge and resource frameworks. In situations characterized by high complexity and high uncertainty, problems can be solved, but the time lapsed will be longer. That means that in a disaster context, innovation or creativity is often required of the responder who must acquire new resources and new knowledge, or use existing knowledge and resources in a new or unconventional way. [One must distinguish here between these situations and the cases of high reliability-organizations, not necessarily innovatives (Roberts et al. 1994).] Thus, as uncertainty increases, the challenge for the disaster responder increases no matter what the level of complexity involved (there are nevertheless the possibility that high level of complexity could lead to more uncertainty).

The idea of uncertainty has long been present in the literature on disasters. Although the focus here is the more general or generic sense of the term, other researchers have proposed different aspects of uncertainty. Blockley (1980) has distinguished between parametric and systemic uncertainties, which were characterized later by Green et al. (1991 p. 4):

> For parametric uncertainties, "what you know, you don't know," while for systemic uncertainties, "what you don't know, you don't know."

Both aspects are present in disaster management, although as I have conceptualized uncertainty, parametric uncertainties are more germaine. That is, the focus is on gaps in a responder's knowledge: lack of information about a situation, lack of knowledge concerning the means for coping with it, and lack of scientific knowledge to understand its genesis and formulate its consequences. Turner (1995) has distinguished between scientific and situational uncertainty, with the first being similar to the uncertainty associated with a risk and the second tied to a particular situation not likely to be reproduced like a disaster. I have argued (Denis 1995b) that the uncertainty important for technical, sociopolitical, and scientific issues would involve Turner's idea of situational uncertainty.

It is important to point out here that in discussing uncertainty, one should not place emphasis only on the negative elements of disaster events. It is acknowledged that disasters can be seen as having positive consequences for individuals and communities. At this juncture, however, the goal is to understand the experience of disasters from the standpoint of disaster managers, whose focus is upon uncertainty reduction in the cause of minimizing negative consequences.

Technology, Structure, and Culture

When the situation has been defined in terms of the issues and their uncertainty, the logical focus can be shifted to the idea of response. In

understanding response activities in situational context, one can utilize the dimensions of technology, structure, and organizational culture as a means of determining or interpreting the level of action demanded by the disaster situation.

In the past, these three dimensions have often not been recognized or conceptualized as distinct (Denis 1990a). For example, technology is often confounded with the structural issue of organizational design, while the impacts of organizational culture were not seen as independent in themselves. Certainly this latter problem was enhanced because of the tendency of disaster research to be conducted within national contexts. The idea that it is important to separate analytically and scrutinize these dimensions by no means is to suggest that they are unrelated to one another. Culture is part of technology as well as part of organizational design; especially if technology is viewed, as Grandstedt (1980) has suggested, as an "integrated tool." But these relationships notwithstanding, each dimension has impacts of interest in itself.

Technology, in the broadest sense of the term, refers to the tools that are used in the response, without making any assumptions about their degree of sophistication or who uses them. This means that technology includes things ranging from manual digging equipment to sophisticated computer software and hardware (Gillespie and Mileti 1977; Gille 1978; Zuboff 1985). In the context of disaster management, structure refers to the division of labor and corresponding integration of responsibilities among the responders themselves. Or, more broadly, the focus is upon the way in which the response work is organized among the responders (Dynes 1970; Duncan 1972; Crozier and Friedberg 1977; Galbraith 1977; Mintzberg 1979). Finally, organizational culture is meant to capture the traditions, collective values, frames of reference, and management styles of the participants (Turner 1971, 1991; Gephart 1984; Shrivastava 1987; Pidgeon et al. 1991).

Technology, structure, and culture conceptually can be considered at two levels. On the one hand, there is the intraorganizational level of participating organizations, each with its own culture, structure, and technology. Indeed, especially when many large organizations are involved, there may be many forms of each dimension with variance present both between organizations and within organizations (Denis 1993). At the second level, there is the megaorganizational level of disaster management (Denis 1995a) which may have, for example, a global-communication technology involving multiple organizations. Similarly, one deals with megaorganizational culture at this level as well, though the notion is more abstract taking the form of a common understanding of what is and is not appropriate relative to disaster response. Finally, megastructure also operates here which may be

seen as the interorganizational relations among disaster responders involved in the disaster-management network (without making assumptions about the qualitative functioning of the network).

The previous discussion of different conceptual levels is meant only to be illustrative; in the remainder of the paper the two levels will not be distinguished. It is presented here only as an interesting possibility for future conceptualizations of disaster response.

As argued earlier, the objective of this paper is largely conceptual: to describe how the technical, sociopolitical, and scientific issues interact with the broader dimensions of technology, structure, and culture. The tactic that is used is the creation of a simple typology by cross-tabulating the issues with the dimensions. The cells in the typology allow one to look at the impacts of the co-occurence of issues with types. In the absence of an existing typology of disasters that permits the combination of technological with natural disasters, it is appropriate to separate these events in the proposed typology. Thus, the traditional distinction between events of natural and technological origin is maintained, and the typology is expanded from nine cells to eighteen cells.

Relative to the typology, it is important at this point to distinguish carefully between "technology" and "technical issues." Technical issues are activities related directly to coping with the disaster agent and the demands it imposes. Each technical issue is an activity (such as search and rescue), with a specific technique associated with it (digging with the hands or with heavy construction equipment). Technology is a broader notion that can be applied to all issues: for example, communication activities, which come under the heading of sociopolitical issues, can make use of various technologies (Denis 1993, p. 219).

With these points made, it is not the purpose of this paper to formalize a typology. Instead, the goal is to raise the issue of the connections between technology, structure, and culture on the one hand, and technical, sociopolitical, and scientific issues on the other. It is hoped that this will promote further discussion and conceptualization on the part of the disaster-research community. At this point, as a means of demonstrating the utility of thinking in these typological categories, I shall turn attention to classifying fifty past disaster events into the cells of the typology. This serves two purposes. First, it shows the practical side of the typology as a means for understanding real events. Second, it helps to promote conceptual growth by identifying ambiguities and interactions that may need to be addressed in future formulations.

Table 1 shows the cross classification of types of issues by the dimensions of technology, structure, and culture, for each of two types of disaster:

technological and natural. The numbers in the cells of the table refer to specific disaster event cases, which illustrate the dominant features of the combination of issue with dimension that corresponds with the focal cell. The following sections reiterate the case examples and indicate the way in which each serves an illustrative purpose. Note that the 1996 Saguenay floods are here labeled natural disasters, although there has recently been controversy regarding its origin: an "act of God" (exceptionally heavy rains) or a technological (dam) failure. The purpose here is not the exhaustive elaboration of the specific disaster events, but instead to indicate which cells would contain recent experiences with disasters. Secondarily, the placement of disaster cases in cells begins to provide a rudimentary explanatory basis for response problems and challenges experienced (reported) in the focal disaster event.

Table 1: Uncertainty in Technology, Structure and Culture by Types of Issues and Disasters (Cells Show Numbered Studies Previously Discussed).

Type of Disaster	Response	Types of Issues: Technology	Sociopolitical	Scientific
Technlogical	Technology	1–2–9	12–13	16–17–21
	Structure	30	22–29	25
	Culture	36–37	44–45–46–51–52	43
Natural	Technology	3–4–5–6–7–8–10–11	14–15–18–19	17–20
	Structure	31–32–33–34–35	23–24–27–28	26
	Culture	38–40	47–48–49–50–53	39–41–42

Technology

The state of technology as evidenced in technical support is probably the issue most frequently raised in debriefings following disasters, at least in Canada. The situations in which technology as a dimension interacts with the other issues are frequent, as evidenced by the counts in the two rows labelled technology in Table 1. One can group the types of uncertainty involved in terms of the presence and state of response equipment. The example disaster cases from Table 1 are enumerated below under the various categories of equipment uncertainty. (Examples from the literature have a reference while the other come from my own research on Canadian disasters.)

The Equipment Is Not Available

1. Train manifests that were not easily accessible or readable during the Mississauga train derailment.
2. The fire bombers were stored for the winter and unavailable for a December 1990 fire in Hagersville, Ontario.
3. Maps of lifeline equipment were initially unavailable for responders in the Edmonton tornado, Ontario.
4. There was a lack of specialized equipment to support heavy rescue operations following the 1988 Armenia earthquakes (Mileti 1989)
5. There was a similar lack of equipment following the 1990 Philippines earthquake (Durkin 1991).
6. During the Aylmer tornado of 1994, police forces lacked protective raincoats designed to sustain very heavy rain.

The Equipment Is Available, But Not Working

7. During the Manitoba floods of 1993, the newly constructed coordination center in Minitonas came underwater (Fowler 1993).
8. During the 1988 Armenian earthquake, U.S. search-and-rescue teams lacked communication equipment owing to the distance between the airport and the site (Krimgold 1989).

The Equipment Is Available, But Not Adequate

9. During the 1985 Gander air crash, there was a lack of protective equipment available for the first responders, apart from the firefighters (Marchant et al. 1989).
10. There was a lack of helicopters for responders in the 1989 forest fires in western Canada (Consulting Panel 1990).
11. In the 1988 earthquake in Armenia, there were not sufficient vehicles to bring the U.S. search-and-rescue teams to the earthquake site from the airport (Krimgold 1989).
12. During the 1995 train derailment in Lennoxville, Quebec, there were not sufficient cellular telephones available for response personnel.
13. The same applies to the 1990 St.-Amable fire in a used-tire dump.
14. During the aftermath of the 1983 Mexico City earthquake, there were insufficient telephones and other basic equipment available to responders (Comfort 1993).
15. During the 1989 forest fires in western Canada, evacuee-reception centers lacked recreational and other equipment for the people who were temporarily relocated (Consulting Panel 1990).

16. In connection with the 1988 St.-Basile-le-Grand PCBs fire, there was insufficient laboratory capability to perform dioxin analysis in a timely fashion (Denis 1990b).

The Equipment Is Incorrect (Systemic Uncertainty)

17. Maps available for response personnel may be geographically erroneous (showing "false north"), leaving users unaware of what they do not know (Green et al. 1991).

Equipment Technically Exists, But Is Politically Unavailable

18. Risk maps existed but were not published prior to the volcanic eruption at Nevado del Ruiz in central America (Voight 1990).
19. Risk maps were unavailable in the 1996 Saguenay floods and dam failure.
20. After the Nevado del Ruiz eruption, technical equipment was available outside the country, but the process of borrowing it was impeded by political considerations (Voight 1990).
21. Calibration of technical equipment in Germany after the Chernobyl accident was complicated by the political boundaries (Czada 1991).

Structure

The structural dimension deals with the way in which the response is organized and carried out. In general, structural matters—when a problem arises in the aftermath—are often pointed to as the cause. One can think of these matters in terms of failure to define responsibilities clearly, poor coordination, poor planning, and poor management. Twelve examples are given which can be assigned to the different cells in the two rows of Table 1 that focus upon structure.

No Clear Definition of Responsibilities

22. Following the Chernobyl accident, fallout drifted over Canada, yet it was not clear what agency was responsible for disseminating information on public health protection.
23. In the 1988 Saguenay earthquake, there was not a clearly defined division of responsibility for public communications between the Environment and Civil Protection departments on one side, and experts in geology on the other side, as uncertainty about the probability of aftershocks was of great concern to the public (Lamontagne et al. 1992).
24. There was confusion about what department or officials were responsible for ordering evacuations following the Nevado del Ruiz volcanic eruptions and mudflows (Voight 1990).

25. In the St-Basile PCB fire, response agencies were not in agreement about who was responsible for coordinating scientific expertise.
26. Different information was released by different levels of government and technical experts regarding risk definition in connection with the Nevado del Ruiz eruption (Voight 1990).
27. During Hurricane Andrew in 1992 in the U.S., there was confusion regarding which levels and agencies of government were responsible for what types of service provision (NAPA 1993)

Difficulty Accepting the Role of an Organization

28. After the 1995 Aylmer tornado, the municipality wanted the Red Cross criteria for helping redefined to a more affluent context, but this was refused by the Red Cross, with frustrations on both sides.
29. During the St-Basile fire, responders were reluctant to accept the role of the police as responsible for communications.

Lack of Emergency Plans Coordination

30. There were different emergency-response plans, during the Exxon-Valdez oil spill, for the pipeline company, the U.S. Coast Guard, the town of Valdez and the State of Alaska (Harrald et al. 1992).
31. The provinces around the Nevado del Ruiz volcano had different emergency-response plans (Voight 1990).

Lack of Activities Coordination

32. Following the 1988 Armenian earthquake, search-and-rescue activities experienced difficulties due to lack of coordination and joint planning among responder organizations (Mileti 1989).
33. The same applies to the 1987 Edmonton tornado (Alberta 1987).

Refusal Among Officials to Recognize Certain Groups

34. Official first responders refused to recognize and use volunteer groups for search and rescue during the 1985 Mexico City earthquake (Dynes et al. 1990).
35. The same was found in the 1989 western Canada forest fires (Consulting Panel 1990).

Culture

The notion of organizational culture is very important to understand how and why disaster-management organizations perform the way they do. In a more general sense, one may also take into account the culture of other organizations in the response set, or the culture of the society in which the

disaster takes place. The following cases represent instances in which one sees the influence of the dimension of culture impinging upon or interacting with the technical, sociopolitical, and scientific issues.

Different Frames of Reference Concerning Expertise

36. Disagreement arose during the 1988 St-Basile PCB fire regarding appropriate firefighting strategies.
37. The same kinds of disagreements were seen in the 1990 St-Amable used-tire fires.
38. There was conflict between the military approach to search and rescue and the popular vision of the public following the Mexico City earthquake of 1985 (Dynes et al. 1990).
39. Foreign experts were accepted by authorities following the 1990 Armenian earthquake, but excluded by the Iranians following their 1990 earthquakes.
40. Following the 1991 Philippines earthquake, some international search-and-rescue teams were identified as more motivated to help than others (Durkin 1991). Perception of the teams is often colored by the relative compatibility of the host and helper cultural worldviews.
41. Citizens sometimes decline to accept experts' definitions of danger. Following the 1991 Philippines earthquake, despite experts' pronouncements of building safety, many citizens chose to remain outdoors in groups despite inclement weather (Durkin 1991).
42. Citizens are sometimes reluctant to accept experts' definitions of a disaster cause as was the case with the Saguenay dam failure and floods.
43. Experts from different nations tended to define the threat following the Chernobyl nuclear power plant accident differently (Czada 1991).

Variation in Constituencies Frame of Reference

44. Depending upon whether the affiliation was with the Indian government, the company involved, or a victim, reports of damage and future risk were radically different following the Bophal chemical release (Shrivastava 1987).
45. In connection with the St-Basile PCB fire, risk frame of reference was radically different between experts and the media covering the event (Denis 1990b).
46. There were very different views of risk across Canadian government emergency responders in the St-Basile PCB fire (Denis 1990b).

47. There were major differences in perception of appropriate response measures between scientific experts, clergy, politicians, and the mass media in connection with the volcanic eruption of Nevado del Ruiz (Voight 1990).
48. Following the 1988 Armenian earthquake, the suggested policy of survivor relocation was perceived to be in opposition to the principles of Armenian Nationalism (Mileti 1989).
49. Communication difficulties may arise between victims and responders, as it did with Mexican-American victims of the Whittier Narrows earthquake of 1987 (Tierney 1988).
50. Following the 1996 Saguenay floods, donations came in because of the picture of damages painted by the media, but at the same time, the pictures drove away vital tourist business during the normally high capacity holidays. This was also reported in connection with the Mt. St. Helens volcanic eruptions (Perry and Lindell, 1990), as well as the eruptions of Mt. Usu on the Japanese northern island of Hokkaido (Perry and Hirose, 1991).
51. Victim frame of reference is often colored by experience; Nuns who had experienced the terror of the Burundi civil war compared that to the Lennoxville train derailment.

Disaster Response Impacts Local Social or Cultural Patterns

52. High salaries available for reconstructive work following the Exxon-Valdez oil spill changed community patterns and consumption behavior of Alaskan natives (Rodin 1992).
53. The temporary evacuation of Canadian native peoples following the 1989 forest fires in Manitoba lead to family stress from being geographically separated and changes in their regular patterns of behavior (Consulting Panel 1990).

Relating Structure, Technology, and Culture

The technology, structure, and culture dimensions are reminiscent of those Russian dolls that fit into one another: the most obvious is technology, followed by structure, and then by culture. The visibility of technology is probably the reason why disaster managers place so much emphasis upon such tools in evaluating their own responses to events. Indeed, the ability to identify clearly the availability of equipment in good working order, and the knowledge of its operations, makes technology a key feature of evaluation simply because it is measurable.

This is probably the reason why there is a tendency to buy equipment following a disaster. In addition, one must also remember that in research

on work satisfaction and motivation appropriate, tools have always been important factors to take into consideration. This means that adequate tools are important, but they represent only the tip of the iceberg. For example, when asking for better communication equipment, it must be remembered that communication consists not only of equipment, but also, and mostly, of human behaviors, and the most sophisticated equipment will not prevent misunderstandings between people due to problems of language.

Technology can also be related to structure, in the sense that what is often considered a technological problem is in fact a problem of organizational structure (Comfort 1993). In the Exxon-Valdez spill, for instance, the lack of coordination of emergency plans and the lack of working equipment both reveal a systemic uncertainty (Blockley 1980) in the form of a lack of planning at the megaorganizational level, a level which was probably not even perceived before the disaster.

The difficulty is that structure is often an esoteric, intangible concept, whereas technology is much more concrete. Uncertainty with regard to structure has been highlighted by the need for coordination, which also appears frequently in debriefings. Who is in charge? Who is responsible? The more serious the disaster, the more tricky this question can be. One must remember that there is a need for coordination at the intraorganizational level as well as among organizations. Between these two levels, there is also a need for coordinating each category of issues. When this is lacking, more uncertainty is added to disaster management.

Finally, the least visible dimension is culture. Organizations acting as responders in a disaster all have a specific culture, which is more or less clearly defined (except for military or paramilitary responders), and this culture will greatly influence their participation in the emergency. It can influence the way they perceive security, and hence the decision taken in the Armenian earthquake, referred to above, to remain close to the airport, but which at the same time made their communication equipment more difficult to operate. In other cases, culture, as well as politics, can influence the way in which help between nations is given or refused (Nevado del Ruiz and the fear of terrorism explaining the U.S.'s reluctance to send experts to Colombia), and accepted or refused (U.S. help accepted by the U.S.S.R. for the Armenian earthquake, but refused by Iran for another earthquake). Culture can also influence the way in which the role of the experts is perceived by the public, political representatives, and other experts, and it can influence the acceptance or otherwise of certain groups in the response (e.g., volunteers).

Such influence is not one-way, however. The disaster response can also bring about certain changes, permanent or otherwise, in the culture of a

community; for example, in the way of life of communities (Exxon-Valdez), in the culture of certain groups (e.g., the experts). A disaster, when particularly poorly managed, can bring about changes in the megaorganization, as happened in the St-Basile fire, as compared with the St-Amable fire a few years later (Denis 1995a). And, of course, a disaster can bring about changes in perceptions of the need for equipment (Alaskan earthquake, among many others), meaning that a change in technology, brought about by a disaster, can filter through the culture; i.e., through a change in values, perceptions, or similar characteristics. Thus, the change is not always direct and can go through any of the three dimensions. The important thing, nevertheless, is to make a distinction between them, in order to provide an adequate response to the expressed need (e.g., after a disaster).

Conclusions

In conclusion, the first point of interest is that culture seems a basic dimension, compared to the other two. This means that, when looking at the relationships between the culture, structure, and technology, culture can greatly influence the way technology and structure will operate. For example, various frames of reference can lead to conflicts regarding the use of technology, or the way to coordinate it (centralize vs. decentralize). The importance of technology, in terms of tools, can also be understood from a cultural point of view.

If culture is fundamental, then the question of its development is of the utmost importance. This can be achieved informally, through the experience of participants in various disasters or through training and exercises, but it must nevertheless be formally established. The best time for that is after the disaster, which is the time for praise and the time for evaluation. At this moment, an atmosphere of learning must be created, meaning that there must be sufficient trust in reporting errors (as in aviation safety). At the same time, as jurisdictional conflicts can play an important role in preventing the development of a megaculture, it must be understood that conflict will not be tolerated as a *modus vivendi*, except within reasonable limits. A parallel can be drawn here with the functioning of matrix structures, when culture was found to be the element that explained why these structures worked in engineering firms but not in a parapublic organization (Denis 1990a).

This is why disaster managers must not only learn to make the distinction between the issues and their uncertainties, but also between technology, structure, and culture. In this way, they can learn to implement one or the other, depending on how appropriate it is in a given situation. They can also come to think in terms of a "safety culture" (Turner 1991), thus moving

from response to prevention, in what has been called the "incubation period" (Turner 1978).

Finally, an important point shown by the Aylmer tornado and the Lennoxville train derailment is the importance of structure and culture for the management team in a municipality. When there is strong team spirit before the disaster, with delegation and trust, then this tends to continue to exist during the disaster as well (and the contrary has also been noted in certain disasters). This means that responders must look not only at their technical support, but also at their structural organization and at the culture underlying them, both in everyday life and in a crisis.

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