Natural Hazards Research and Applications Information Center
Campus Box 482
University of Colorado
Boulder, Colorado 80309-0482

INCREASING PROBLEM-SOLVING CAPACITY BETWEEN ORGANIZATIONS

Louise Comfort
Anthony Cahill

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Increasing Problem Solving Capacity Between Organizations: The Role of Information in Managing the May 31, 1985 Tornado Disaster in Western Pennsylvania

I. The Problem: Extending Problem Solving Capacity Between Organizations

Fitting the unique capabilities and limitations of human decision makers to the systematic requirements of interorganizational problem solving is difficult in stable environments. In the dynamic, uncertain environment of emergency management, the problem escalates in geometric proportion to the scale of the emergency. Yet, as the size and complexity of the emergency increases, the need for interorganizational problem solving becomes imperative for effective action. How to extend problem solving capacity between organizations in the complex environment of an actual disaster is a recurring dilemma in the interjurisdictional emergency management process. The difficulties are compounded by significant differences in training, facilities, experiences and conceptual understanding of the requirements for action at the diverse levels of government involved in the emergency management process. As the locus of decision making shifts from city to county to state to federal levels of government and back again in a major disaster, public personnel unfamiliar with the working environments and cultural mores of other governmental organizations and jurisdictions are expected to work together smoothly and efficiently according to a rationally designed organizational plan. In practice, problem solving capacity drops repeatedly as public service personnel move from familiar operating conditions across organizational boundaries into more complex, uncertain and dynamic settings (Comfort, 1985).

This problem, documented in actual emergency operations settings (Rubin, 1985; Comfort, 1985), challenges established plans for interorganizational

command and control (Giuffrida, 1983). The Federal Emergency Management Agency (FEMA) has clearly delineated a set of mission responsibilities for each level of government involved in the emergency management process (McLoughlin, 1985). This official designation of emergency functions is further augmented by emergency plans at state, county and city levels. Emergency planning is supported by legal requirements, resulting in at least formal recognition of its utility by jurisdiction at all levels.[1]

This recurring decrease in problem solving capacity in the component parts of a multiorganizational system runs counter, also, to observations of multiorganizational response to certain kinds of demands in particular disaster settings. Thomas Drabek et al. (1981) describe emergent multiorganizational networks in search and rescue operations following the occurrence of a natural disaster. Drabek et al. (1981:243) state:

> Emergency managers must recognize that disaster responses in American society are multiorganizational, emergent and frequently require improvisation.
>
> Emergent multiorganizational networks responding to natural disasters in American society are loosely coupled systems and will remain so.

In using the term, 'emergent', Drabek et al. connote a natural, evolving set of linkages among the participating organizations that omits prior recognition of emergency responsibilities and previous assessment of organizational performance capacity. This analysis does recognize that organizations learn through interaction with other organizations engaged in emergency response activities. Missing, however, is acknowledgement of a stated plan for interorganizational emergency response and the discrepancy between the stated plan and actual performance.

In their study, Drabek et al. mapped the number and type of interactions among a mix of public organizations with emergency responsibilities, voluntary

organizations that offered their services and individuals who volunteered their time and skills. Yet, these researchers studied only a particular phase of the emergency management process with a single, clear focus, search and rescue, and they selected remote areas as their research settings. While their findings characterize the patterns of search and rescue operations in these settings, they do not appear consistent with the more complex interactions among public organizations over the full range of intergovernmental functions in the emergency management process. Their findings appear to draw upon the mores of cooperation and mutual assistance characteristic of small towns and rural communities. In contrast, these norms may not apply to organizational interaction in more complex urban settings where the members have had little previous interaction or personal contact (Comfort, 1983).

In practice, neither the formal allocation of specific mission responsibilities for organizations across jurisdictional boundaries by the Federal Emergency Management Agency nor the identification of developmental processes between organizations by Drabek et al. explain fully the task of building interorganizational problem solving capacity in emergency management. This paper addresses the larger set of interorganizational operations in emergency management and the effects of planning and interaction in the pre-disaster phases of mitigation and preparedness upon the capacity for effective interorganizational performance in the post-disaster phases of response and recovery.

The thesis of this paper is that interorganizational problem solving capacity increases as the flow of information, articulation of professional norms for selecting and interpreting relevant information, interpersonal communication and regular opportunities for reflection and redesign of

performance increase among the participating organizations. These activities are not likely to occur without design between organizations across jurisdictional boundaries, particularly in large scale emergency operations (Simon, 1969, 1981). Information, in this process, plays an integrating role, as it circulates within and between participating organizations. Flowing through open and two-way communication processes among the participating organizations, information creates a basis of shared understanding of emergency requirements and supports norms for collective action in the emergency management system. The ability to gather, process and disseminate information quickly and accurately through the multijurisdictional emergency management system serves to reduce uncertainty at each governmental level, thereby increasing the effectiveness of performance for the system as a whole. Without systematic design of interorganizational learning processes, problem solving capacity between organizations tends to decrease under conditions of uncertainty and complexity.

II. The Concept of Interorganizational Problem Solving

The concept of interorganizational problem solving is a construct derived from observing a set of actions, individual and organizational, directed simultaneously toward solving different aspects of the same large, complex problem. While the scope of the problem extends beyond any single individual or organization's capacity to address, a solution is produced from multiple contributions of information, time and skill. When the task of marshalling and sequencing these concurrent problem solving activities involves multiple organizations and governmental jurisdictions as in the emergency management system, problem solving assumes a level of complexity and dynamic interaction

that demands an appropriate conceptual framework. Yet, interorganizational problem solving is intrinsically dependent upon individual problem solving capacity, and is subject to the same constraints set by patterns of human cognition and memory.

Problem solving between organizations, as for individuals, is essentially a process of discovering "what works" under specific conditions with particular resources and constraints. Herbert Simon (1977:151) describes the problem solving process as:

> ...a process of selective trial and error, using heuristic rules derived from previous experience, that are sometimes successful in discovering means that are more or less efficacious in attaining some end. It is legitimate to regard the imperatives embodying the means as 'derived' in some sense from the imperatives embodying the ends, but the process of derivation is not a deductive process, it is one of discovery...

Central to this problem of discovery is establishing a clear connection between actions and their consequences (Simon, 1977:146). Direct feedback from actions taken allows individuals to assess the consequences, thereby determining the utility of their actions. If effective, the action is likely to be discarded in favor of an alternative. In moving from individual to organizational action, the feedback linkage becomes less direct. It is less certain what actions by which individuals produce what consequences. The connection between actions and consequences becomes even more tenuous in moving from organizational to interorganizational problem solving. It is at this point that problem solving performance drops. Trials made in error are not corrected. Information essential to appropriate action is not transmitted to relevant participants. Uncertainty regarding the outcome of proposed actions increases, and learning among the participants decreases.

Discovering solutions to complex problems is a dynamic process, especially as it occurs between multiple organizations. Four principal

components interact in this process, with varying levels of intensity and influence upon the participating organizations over time. First, the flow of information within and between the participating organizations is essential to determining if, and what kind, of problem exists. The style, content and direction of this information flow is critical to eliciting the attention and cooperation of participant organizations in the problem search (Klauss and Bass, 1982). Second, the articulation of professional norms serves the vital function of screening the flow of information by a commonly accepted set of criteria to select those elements in the situation that are central to the problem and that require the most immediate allocation of attention and resources. Without some means of interpreting incoming information within the context of the organizations' operating environment, additional information tends to overwhelm rather than inform decision making capacity between organizations (Comfort, 1985). This tendency is magnified under conditions of uncertainty, when information processing requirements for decision making in organizations tend to increase (Cheng & McKinley, 1983).

The third component, interpersonal communication, drives the dynamic of the the process. In mobilizing the attention, commitment and coordinated action of multiple participants in a complex problem solving process, the quality and style of interpersonal communication is vital (Klauss & Bass, 1982). Motivating participants to overcome the initial doubt, incomplete understanding and resistance to change inherent in any problem solving process is indeed more art than science, and the task is complicated even more by the involvement of multiple organizations. In environments of relative stability, the "personal factor" (Nelson & Yates, eds., 1978) contributes substantially to creating the common understanding and trust among individuals necessary for joint action. In

environments of high uncertainty, this quality of interpersonal trust is essential for collective action. Building that trust in a multiorganizational operating environment is a complex process, perhaps the most difficult task involved in creating an integrated emergency management system. Extending trust is inherently a voluntary act, and withholding trust, despite executive orders, administrative regulations or policy statements, is a time-honored mechanism of resistance to change. Recognizing that effective problem solving in environments of high uncertainty requires building a set of relationships among the participants based upon a common objective and shared commitments, rather than external requirements, is a crucial first step in generating this trust (Schoonhoven, 1981). Authority among the participants shifts from a base of force to one of 'wisdom or spirit' (Tonnies, 1887, 1957), and incentives for individual action within the group shift from maximizing control through increasing one's power over others to maximizing effectiveness by increasing one's understanding of the problem and acting accordingly.

Creating such a basis for collective action between organizations involves extending the reciprocal, binding relationships characteristic of community or 'gemeinschaft' (Tonnies, 1887, 1957), into the larger, more complex relationships characteristic of society or 'gesellschaft.' Tonnies (1887, 1957:47) referred to the distinctive common bond among the members of a community as 'consensus' or "...the special social force and sympathy which keeps human beings together as members of a totality." To Tonnies, consensus or understanding was built through language, or the conscious expression of "deep feelings and prevailing thoughts" among members of the community. While clearly there are constraints of time and opportunity for intimate expression of personal thoughts in large, complex organizations, interpersonal communication

necessarily occurs. The style of communications within and between organizational participants may either invite expression of differing perceptions of a given problem and encourage active engagement in responsible social action, or it may discourage such reciprocal problem solving activity.

Finally, regular opportunities for reflection on actual performance and redesign of actions based upon incoming information complete the learning cycle, within as well as between organizations (Argyris, 1982). While such opportunities may occur naturally in smaller communities, they require design in larger, more complex organizational environments (Simon, 1969, 1981). Competing demands for attention from many participants engaged in diverse activities tend to diffuse the common focus on a single problem (Cohen, March & Olsen, 1971), and the problem solving capacity of both individuals and organizations drops. When the problem is complex, as in a natural disaster, and constraints upon time and resources are severe, the effectiveness of coordinated action depends upon the extent to which multiple organizations can concurrently identify problems in their respective performances and adjust their actions accordingly in order to accomplish their shared goal (Cohen, 1981, 1984).

In summary, the concept of interorganizational problem solving moves the level of interaction among individuals to a magnitude of abstraction that exceeds the limits of human short-term memory and information processing capacity. The model of an integrated emergency management system, based upon this concept, simply exceeds the cognitive abilities of human decision makers, without technical assistance. The problems generated by a natural disaster are so large and so complex, they strain the problem solving capacity of managers using standard administrative practices of command and control. Opportunities for error increase geometrically with the scope of the disaster, and chances of

identifying and correcting them in timely fashion through traditional administrative means are remote. This recurring strain upon interorganizational problem solving capacity was vividly demonstrated in the emergency management process activated in response to the May 31, 1985 tornado disaster in Western Pennsylvania.

III. Interorganizational Problem Solving in the Western Pennsylvania Tornado Disaster, May 31, 1985

Early in the evening of May 31, 1985, a series of tornadoes struck Western Pennsylvania with devastating force. In less than five hours, four separate sets of tornadoes ripped through thirteen counties, destroying virtually everything in their paths. The tornadoes left 64 people dead and caused an estimated $232 million loss in property damage.[2] Confronted with massive destruction, local and state officials moved immediately to request a presidential declaration of disaster in order to implement the federal policies on disaster relief and recovery in thw shattered communities. On June 3, 1985, President Reagan declared 10 counties in Western Pennsylvania a disaster area.[3] The president's declaration activated the federal government's policies in the recovery and reconstruction phases of the disaster, and at that point, the entire interjurisdictional emergency management system became actively involved in coping with the demands of the disaster.

The tornado disaster provided a sobering but timely example of efforts to implement an interorganizational cooperation and coordination to meet the needs of the affected families, towns and counties. The degree of devastation was such that no single individual, organization or jurisdiction could cope with it alone. The full complement of policies, plans and resources available through the interjurisdictional emergency management system directed by the FEMA was in

effect. In short, the best efforts of current administrative policies and practices were placed in operation in response to this disaster. To what extent did the expected interorganizational problem solving occur, and what are the requirements of interorganizational problem solving in an actual disaster? This disaster created an unusual opportunity to observe the activation of the interorganizational emergency management process and to assess its capacity for problem solving. To do so, this researcher, with the assistance of co-instructor Anthony G. Cahill and 16 graduate students in the Policy Seminar, Spring Term, 1985, at the Graduate School of Public and International Affairs, University of Pittsburgh, conducted a study of problem solving in the emergency management process as it operated in the tornado disaster in Western Pennsylvania.

The study focused on the role of information in emergency management. As researchers, we were interested in identifying the amount and types of information available to decision makers, as well as the patterns of interpretation, communication and application of this information to solving problems at different levels of decision making in the emergency management process. In the study, three groups of decision makers were interviewed: 95 citizens who experienced the disaster and who confronted the problems of protecting themselves and their families; 139 local government officials from 7 of the 10 affected counties in Western Pennsylvania who had the legal responsibility for first response in their communities; and 10 federal officials who were responsible for administering federal programs of disaster assistance in the thirteen counties struck by tornadoes in federal Region III, which includes Pennsylvania.

Reviewing the findings in light of the four components identified in the

construct of interorganizational problem solving, several major discrepancies appear between theory and practice in the implementation of the emergency management policies and plans. In reference to the first component, the open flow of information within and between organizations, the evidence clearly documents a lack of information available to decision makers at each level of problem solving as they confronted the demands of the disaster. At the citizens' level, lack of information about the approaching tornadoes or what to do in case of a tornado very seriously restricted their ability to take effective measures to protect themselves and their families. Table 1 cites the finding that 63 out of 88 citizens responding to the question, or 71.6%, reported receiving less than 5 minutes' warning before the tornado struck. Only 5 citizens, or 5.7%, learned of the approaching tornadoes an hour or more before they occurred. When asked how they learned of the approaching tornado, 60.4% of those citizens responding to the question reported that they learned from family, friends or neighbors. These data are cited in Table 2. Only 2 citizens, or 3.2%, learned of the approaching tornadoes through public sirens or emergency warning systems.

In contrast, Tables 3, 4 and 5 cite data from the local officials' survey in response to similar questions. Of the 139 local officials included in this survey, 93 were actively involved in disaster response activities in their communities. Of the 91 active participants responding to the question, 22, or 24.2%, learned of the tornado more than an hour before it occurred, while 30, or 33%, had less than five minutes' warning. An additional 35.2% had between 5 and 59 minutes' warning. When asked how they learned of a tornado in their vicinity, nearly half (48.9%) of the local officials reported public sources of emergency information: fire radio, National Weather Service, County Dispatch

Table 1

Time of Citizens' Reception of Tornado Warning,
Western Pennsylvania, May 31, 1985

"When did you first learn that a tornado was in your vicinity?"

	N	Rel. %	Adj. %
3-4 hours	1	1.1	1.1
2-3 hours	2	2.1	2.3
1-2 hours	2	2.1	2.3
30-59 minutes	2	2.1	2.3
15-29 minutes	8	8.4	9.1
5-14 minutes	8	8.4	9.1
Less than 5 minutes	63	66.3	71.6
No warning	0	0.0	0.0
Afterwards	2	2.1	2.3
No response	7	7.4	Missing
	95	100.0	100.0

Valid cases: 88
Missing cases: 7

Table 2

Sources of Citizens' Tornado Warning, Western Pennsylvania,
May 31, 1985

"How did you learn that a tornado was in your vicinity?"

	N	Rel. %	Adj. %
Heard it	3	3.0	4.7
Saw it	21	22.1	33.8
Family	3	3.2	4.7
Friend/neighbor	11	11.6	17.2
Radio	11	11.6	17.2
TV	13	13.7	20.8
Siren	1	1.1	1.6
Emergency warning	1	1.1	1.6
No response	31	32.6	Missing
	95	100.0	100.0

Valid cases: 64
Missing cases: 31

Table 3

Time of Local Officials' Reception of Tornado Warning,
Western Pennsylvania, May 31, 1985

"When did you first learn that a tornado was in your vicinity?"

	N	Rel. Freq. %	Adj. Freq. %
4-6 hours	1	1.1	1.1
3-4 hours	2	2.2	2.2
2-3 hours	1	1.1	1.1
1-2 hours	18	19.4	19.8
30-59 minutes	6	6.5	6.6
15-29 minutes	10	10.8	11.0
5-14 minutes	16	17.2	17.5
Less than 5 minutes	30	32.3	33.0
No warning	1	1.1	1.1
Afterwards	6	6.5	6.5
Other	0	0.0	0.0
No response	2	2.2	Missing
	93	100.0	100.0

Valid cases: 91
Missing cases: 2

Table 4

Sources of Local Officials' Tornado Warning,
Western Pennsylvania, May 31, 1985

"How did you learn that a tornado was in your vicinity?"

	N	Rel. Freq. %	Adj. Freq. %
Fire radio	5	3.8	4.9
National Weather Service	4	4.3	5.3
County emergency dispatch system	33	35.5	43.4
Public emergency broadcast system/ siren/bell	2	2.2	2.6
Communication from department or public service personnel	10	10.8	13.2
Television broadcast	9	9.7	11.8
Radio news	4	4.3	5.3
C.B. radio	1	1.1	1.3
Neighbor, friend, relative	7	7.5	9.2
Other	14	15.1	Missing
No response	3	3.2	Missing
	93	100.0	100.0

Valid cases: 76
Missing cases: 17

Table 5

Actions Taken by Local Officials in Response to Tornado Warning, Western Pennsylvania, May 31, 1985

"What did you do when you realized the tornado was actually coming toward you?"

	N	%
Tried to warn community	47	29.4
Tried to contact other public service personnel	18	11.2
Tried to contact family members	30	18.8
Tried to warn friends and neighbors	16	10.0
Sought shelter immediately	16	10.0
Other	21	13.1
Did not believe there was any danger	12	7.5
	160*	100.0

*Multiple responses coded
N of cases: 93

Table 6

Actions Taken by Local Officials Directed toward Citizens in Response to Tornado Warning, Western Pennsylvania, May 31, 1985

"What means, if any, did you use to alert citizens to the approaching tornado?"

	N	%
Community warning system	24	24.0
Public emergency broadcasting system	16	16.0
Vehicle with loudspeaker	15	15.0
Telephone ring-down	18	18.0
House-to-house canvass	13	13.0
Other	14	14.0
	100*	100.0

*Multiple responses coded
N of cases: 93

systems or community emergency broadcast system or siren. An additional 10.8% learned of the tornado through communication from their department or other public service personnel.

Further, half of the local officials actively involved in the disaster, 47 out of 93 (50.5%) reported they tried to warn their communities of the approaching tornado, and 40 out of 93 (43%) reported they used the community warning system or public emergency broadcasting system. Table 5 presents the actions taken by public officials, reporting multiple responses and Table 6 cites the means used by local officials to alert citizens in their communities, again reporting multiple responses. These data reveal a serious discrepancy between the efforts of local officials to warn the citizens in their communities of the approaching danger and the citizens' reception of this information. Clearly the flow of information between local officials and citizens did not adequately facilitate problem solving, as both groups, individually and organizationally, sought to respond to the staggering demands of the tornado disaster.

At the federal level, the same discontinuity in the information flow affects the problem solving process adversely in the intergovernmental administration of disaster relief. Of the ten federal officials interviewed in this survey, most found the level of information available to them regarding characteristics of the tornado-stricken counties middling at best and tending toward low or no information. Table 7 cites the findings on this issue. In contrast, federal officials readily identified the kinds of information that would have been helpful to them in their administration of federal disaster assistance programs. Table 8 cites these data.

Especially significant is the comparison of available to desired information regarding emergency plans for local government, as shown in Tables 7

and 8. Under federal guidelines for the integrated emergency management system, each community is expected to develop its own emergency plan and relay it to the next level of government, the county. The county, in turn, develops an emergency plan for its jurisdictional responsibilities, incorporating plans and information from the set of communities within its boundaries into its data base. The counties relay this information on to the state, which, in sequence, passes it on to the federal administration in emergency management. According to the official plan, federal officials should have full access to vital characteristics regarding communities involved in any disaster. The data presented in Table 7 show that only 3 out of 10 federal officials rated the data available to them regarding the local counties as high (4 or 5) on a scale of completeness ranging from 5 to 1. Table 8 shows that 5 of the 7 officials responding to this question reported that information regarding emergency plans for local governments would have been very helpful (4 or 5 on a 5-point scale) in their work. Again, these data reveal that the present flow of information does not adequately support the problem solving process between jurisdictional levels in the emergency management process.

In further analysis of the responses from citizens, local officials and federal officials engaged in problem solving at their respective levels of involvement in the emergency management process, the data cite little support for the other three components identified as integral to effective interorganizational problem solving. In reference to the articulation of professional norms to assist in screening and processing information to facilitate problem solving, 44.5% of the citizens interviewed reported that they "never got information" from public officials or agencies about what to do in a tornado. Table 9 cites the data in response to this question. Fewer citizens,

Table 7

Types and Completeness of Information Available to Federal Officials in Managing Disaster Relief, Western Pennsylvania, May 31, 1985 Tornadoes

"How complete was the information that you had regarding vital characteristics of counties in Western Pennsylvania?" Please rate from 5 = complete information to 1 = no information.

	5	4	3	2	1	NR	Total
Population characteristics	2	4	2	1	1	0	10
Infrastructure: roads, bridges, tunnels	0	1	2	2	4	1	10
Industrial plants, construction	0	0	1	4	4	1	10
Emergency plans for local governments	2	1	2	3	1	1	10
Residential concentrations	1	2	4	3	0	0	10
Medical facilities	0	1	1	4	3	1	10
Utilities	0	2	2	3	1	2	10
Transportation access: airport, railways, heliport	2	2	3	2	1	0	10
Public broadcasting stations	0	4	1	2	2	1	10
Other	0	1	0	0	2	0	3

N of cases: 10
NR = No Response

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Table 8

Types of Information about Local Communities Desired by Federal Officials in the Administration of Disaster Relief, Western Pennsylvania, May 31, 1985 Tornadoes

"What kinds of information would have been most helpful to tyou in assessing the impact of the tornadoes upon the communities of Western Pennsylvania?" Please rate from 5 = most helpful to 1 = least helpful.

	Most Helpful 5	4	3	2	Least Helpful 1	NR	Total
Population characteristics	6	1	1	0	1	0	9
Infrastructure: roads, bridges, tunnels	1	0	3	1	3	1	9
Industrial plants; construction	1	2	2	1	3	0	9
Emergency plans for local governments	4	1	2	0	0	2	9
Residential concentrations	4	4	1	0	0	0	9
Medical facilities	0	4	1	1	2	1	9
Utilities	1	5	1	0	2	1	9
Transportation access: airport, railways, heliport	3	2	1	0	1	2	9
Public broadcasting system	0	3	1	0	2	3	9
Other	0	0	0	0	0	0	0

Valid cases: 9
Missing case: 1
NR = No Response

but still nearly 30%, reported they received no information from public officials regarding other kinds of emergencies. These data are presented in Table 10. More vivid were the responses from citizens who voluntarily stated they had "never seen a tornado before" and "didn't know what to do."[4] In contrast, 67% of the citizens, as shown in Table 11, stated that warning systems would have helped them most to protect themselves, their families and their property from the tornado. The majority of citizens acknowledged that the introduction of professional means of identifying the level of risk in emergencies would help them to take protective measures. Without public education to assist citizens in interpreting the symptoms of a tornado and in taking appropriate safety measures, emergency warnings or public announcements by local officials have little effect.

When asked for their professional judgment regarding the effectiveness of the emergency plans in their communities, only 11.8% of the local officials who participated in disaster response activities reported "very effective." Nearly twice that proportion, 22.6%, of the officials reported the plans in their communities to be "not so effective; not at all effective" or reported "no plan in community." These data, cited in Table 12, show that local officials were operating to meet the demands of the disaster in their communities without the degree of professional planning that would have facilitated their emergency response process.

Federal officials, as well, reported the need for better management of information among the organizations participating in the emergency response and recovery process.[5] Individual comments stated the desirability of more professional training and interaction between the jurisdictional levels in the emergency management system.

Table 9

Citizens' Reception of Information from Public Officials Regarding Tornado Emergencies, Western Pennsylvania, May 31, 1985 Disaster

"Have you ever gotten information from public officials or agencies about what to do in a tornado? If so, how?"

	N	%
Public education program	10	9.4
Brochures	6	5.2
Public announcements	7	6.5
Television	15	13.9
Radio	11	10.3
School	4	3.7
Prior knowledge, intuition	5	4.6
Never got information	48	44.5
Other sources of information	2	1.9
	108*	100.0

*Multiple responses coded;
missing data excluded
N of cases: 95

Table 10

Citizens' Reception of Information from Public Officials Regarding Other Emergencies, Western Pennsylvania, May 31, 1985 Disaster

"Have you ever gotten information from public officials or agencies about what to do if other kinds of emergencies happen? If so, how?"

	N	%
Public education program	11	8.7
Brochures	6	4.7
Public announcements	9	7.1
Television	37	29.1
Radio	16	12.6
School	1	.8
Prior knowledge, intuition	2	1.6
Never got information	38	29.9
Other	7	5.5
	127*	100.0

*Multiple responses coded;
missing data excluded
N of cases: 95

"WHAT KINDS OF INFORMATION WOULD HAVE HELPED YOU PROTECT YOURSELF, YOUR FAMILY OR PROPERTY FROM THE TORNADO BETTER?"

	Safety Measures		Radio Warning		Hot Lines		Other Warning Systems (Sirens, etc.)		First Aid/ Medicine		Utility Connections		Family Safety Plan	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Helped Most (5)	57	63.3	57	62.2	31	34.3	61	67	49	54.4	55	61.1	72	78.3
Helped Moderately (4)	16	17.8	8	8.8	12	13.3	9	9.9	13	14.4	12	13.3	9	9.8
Helped Somewhat (3)	7	7.8	5	5.5	10	11,1	8	8.8	13	14.4	9	10	3	3.3
Helped Little (2)	3	3.3	7	7.7	13	14.4	4	4.4	6	6.7	4	4.4	2	2.2
Helped Least (1)	7	7.8	14	15.4	24	26,7	9	9.9	9	10	10	11.1	6	6.5
Total Valid Cases	90	100.0	91	100.0	90	100.0	91	100.0	90	100.0	90	100.0	92	100.0
Invalid Cases (Missing Data)	5		4		5		4		5		6		3	
Total Cases	95		95		95		95		95		95		95	

In reference to interpersonal communication, the third requirement of interorganizational problem solving, the data suggest that respondents at each level of the emergency management system communicate more easily and frequently with participants at their own level than with participants at other levels, despite the interjurisdictional demands of the emergency management process. Table 13 reports that the largest group of citizens turned first to family, friends or neighbors for assistance after the tornado. While nearly one-third, 32.3%, of the local officials reported that local, state and federal agencies worked to gather, analyze and share needed information quite or very effectively, approximately one-fifth, 19.4%, stated that agencies at the three different levels of government worked not so effectively or not at all effectively to meet information needs. More significantly, one-fourth of the local officials, 25.8%, did not respond to this question, demonstrating a reluctance to make a judgment about the effectiveness of interagency performance on this critical task. These data are presented in Table 14. At the federal level, officials reported the need for continual interchange of information among participating public agencies to improve the emergency management process. At the Disaster Field Office in Meadville, Pennsylvania, the Federal Coordinating Officer scheduled daily staff meetings to coordinate information within and between federal and state agencies.[6] These findings document the importance of interpersonal communication in the dynamic operating environment of a disaster.

On the final requirement for an effective interorganizational problem solving process, reflection and redesign, all three groups surveyed evidenced thoughtful review of the process. Of the citizen respondents, 77% had suggestions for change, focusing primarily on better means of information flow, professional planning and education. These data are cited in Table 15. Among

Table 12

Perceived Effectiveness of Community Emergency Plans, Local Officials Involved in Response Activities, Western Pennsylvania, May 31, 1985 Tornado Disaster

"In your professional judgment, how effective was the emergency plan in your community for the assignment of emergency responsibilities and coordination of action among public service agencies?"

	N	Rel. Freq. %	Adj. Freq. %
Very effective	11	11.8	12.9
Quite effective	22	23.7	25.9
Moderately effective	27	29.0	31.7
Not so effective	8	8.6	9.4
Not at all effective	4	4.3	4.7
Plan not activated	4	4.3	4.7
No plan in community	9	9.7	10.6
Other	3	3.2	Missing
No response	5	5.4	Missing
	93	100.0	100.0

Valid cases: 85
Missing cases: 8

Table 13

Communication Patterns in Requesting Disaster Assistance, Citizens' Survey, Western Pennsylvania, May 31, 1985 Tornadoes

"Just after the tornado passed, what did you do to get help?"

	N	%
Assistance came to me	19	20.6
Went to, or called, local officials	8	8.7
Went to, or called, Red Cross	3	3.3
Went to, or called, family, friends or neighbors	34	37.0
Went to, or called, church or church members	2	2.2
Helped others	4	4.3
Other responses	13	14.1
Did not need help	3	3.3
Nothing; didn't know what to do	6	6.5
	92*	100.0

*Multiple responses coded; missing data excluded
N of cases: 95

Table 14

Local Officials' Perception of Intergovernmental Cooperation Regarding Information Management, Western Pennsylvania, May 31, 1985 Tornado Disaster

"In your professional judgment, how effectively have local, state and federal agencies worked to gather, analyze and share needed information in this disaster?"

	N	Rel. Freq. %	Adj. Freq. %
Very effectively	17	18.3	27.5
Quite effectively	13	14.0	21.0
Moderately effectively	14	15.0	22.0
Not so effectively	8	8.6	13.0
Not at all effectively	10	10.8	16.2
Other	7	7.5	Missing
No response	24	25.8	Missing
	93	100.0	100.0

Table 15

Citizens' Suggestions for Public Action to Protect Community in Future Emergencies, Western Pennsylvania, May 31, 1985 Tornado Disaster

"What suggestions would you make to public officials in order to protect your community in future emergencies?"

	N	Rel. Freq. %	Adj. Freq. %
Emergency management plan	10	10.6	11.9
Public education	17	17.9	20.2
Weather monitoring	7	7.4	8.3
Warning/siren system	39	41.1	46.4
Public response is satisfactory	9	9.4	10.7
Public response is not satisfactory	2	2.0	2.8
No response	11	11.6	Missing
	95	100.0	100.0

Valid cases: 84
Missing cases:11

local officials, 42% offered suggestions for change, emphasizing the need for improved communication, organization, coordination and cooperation.[7] Federal officials stressed the importance of managing the information for their decision process, recommending the utilization of appropriate computer technology to assist in coping with both the great volume and rapid rate of change in information involved in disaster management.[8] These findings document the importance of reflection and redesign for the problem solving process. More significant, they demonstrate that the participants in this tornado disaster are aware of this need and are already engaging in reflection on how to improve the problem solving process for future emergencies. This is a critical stage for the thoughtful review of performance at each level of the interorganizational emergency management process and a necessary first step in its redesign for more effective performance as a system.

IV. Requisite Conditions for Interorganizational Problem Solving

The data from the surveys of citizens, local officials and federal officials involved in the tornado disaster in Western Pennsylvania underline the importance of the four components identified earlier as essential to interorganizational problem solving. The information requirements for interorganizational problem solving in a disaster of this magnitude and scope overwhelmed the existing patterns of information flow, professional planning and interpersonal communication. Citizens, local officials and federal officials found serious discrepancies between the amount and kinds of information available to them and the amount and kinds of information that would have helped them to meet the demands of the disaster more quickly, appropriately and efficiently. Interorganizational problem solving requires a distinctive mode of

information gathering, processing and dissemination that will extend human problem solving capacities in complex, uncertain settings.

The most interesting finding of the study, however, is that significant proportions of each group surveyed are aware of this discrepancy between available and desired information. This awareness, highest immediately following a disaster, can serve as a vital element in initiating change at each level in the intergovernmental emergency management process. Advances in telecommunications and computer technology provide the technical capability for interorganizational decision support. Designing and implementing their appropriate use becomes central to the effective development of interorganizational problem solving in an integrated emergency management system. Increasing the technical capacity to manage information would facilitate and extend the substantial degree of interorganizational learning demonstrated by citizens and public officials involved in the emergency response and recovery activities following the Western Pennsylvania tornado disaster.

NOTES

[1]The actual development of emergency plans at the county and city levels is somewhat problematic. In a recent inquiry into the status of emergency planning in 16 major U.S. cities, four of the sixteen -- Pittsburgh, Boston, Cleveland and Newark -- did not have emergency plans officially in place. Four others, Atlanta, Minneapolis, Miami and St. Louis, were in various stages of review and development of their plans and were not prepared to participate in the survey. The latter four cities did, however, submit the emergency plans for the counties in which they were located. Although this inquiry was not comprehensive, it does indicate that 8 of the 16 cities in this selective survey did not have fully developed and current emergency plans ready for operation. The status of planning in smaller cities and rural communities is even less developed, as evidenced by the responses of 139 local officials to a survey following the May 31, 1985 tornado disaster in Western Pennsylvania. See "The Role of Information in Emergency Management," Research Report, Policy Seminar 296A, Graduate School of Public and International Affairs, University of Pittsburgh, Pittsburgh, PA, July 23, 1985.

[2]Pittsburgh Post Gazette, June 2, 1985.

[3]Pittsburgh Post Gazette, June 4, 1985.

[4]Citizen Interview, Hermitage, PA, June 15, 1985.

[5]Federal Officials' Survey, Disaster Field Office, Meadville, PA, June 14-30, 1985.

[6]This researcher observed 2 joint Federal-State staff meetings, with the consent of the Disaster Coordinating Officer, at the Disaster Field Office in Meadville, PA on Saturday, June 8, 1985 and Friday, June 14, 1985.

[7]Local Officials' Survey, Western Pennsylvania counties of Beaver, Butler, Crawford, Erie, Forest, Mercer and Venango, June 15 - July 20, 1985.

[8]Federal Officials' Survey, Disaster Field Office, Meadville, PA, June 14-30, 1985.

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