

University of Delaware
Disaster Research Center

MISCELLANEOUS REPORT
#28

THE REALITY OF LOCAL COMMUNITY
CHEMICAL DISASTER PREPAREDNESS:
THREE CASE STUDIES*

E.L. Quarantelli

with
assistance of
Thomas Gabor
Quinten Johnson
Teresa Lewis
Robert Swisher

June, 1981

*The data used in this report were obtained under grant PFR-7714445 from the National Science Foundation (NSF). However, all statements made represent the views of the authors and the Disaster Research Center, and not necessarily those of NSF.

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ACKNOWLEDGMENTS

This publication is a collective product. Besides myself, four former members of the Disaster Research Center's staff contributed to the early drafts of different parts of this report. Robert Swisher wrote the original version of Chapter II. A detailed draft of Chapter III was written by Tom Gabor. The initial extended outline of Chapter IV was developed by Quinten Johnson. Teresa Lewis expanded on that outline. These drafts were partly rewritten and appear as the three case studies in this report.

While no attempt was made to impose a completely standardized style, an effort was made to insure roughly equivalent coverage of different comparable topics. In most instances, this required adding substantive material to these drafts. Thus, while the writers of the different drafts provided the original versions for the different case studies, they are not responsible for the final text which appears in this publication.

I want to thank all four authors for their contributions to this report. As partial recognition of their contributions, the names of the writers have been used as the pseudonyms for the communities discussed.

At various stages in the development of this publication, Jane Gray and Nan Baer also provided useful comments on the various draft chapters. Their help is greatly appreciated.

In addition, thanks must be given again to Elizabeth Wilson, the Center's Executive Director. She capably edited the final version of the manuscript. This was an unusually difficult task in this instance because of the necessity of having to harmonize the writings of five different authors.

Shari Carres and Ruth Orr are also thanked for typing the earlier drafts of this report. Tina Wren and Carol Cliff did their usual competent job in

typing the final version. Proofreading assistance was provided by Ruth Orr.

Other parties besides the Disaster Research Center's staff played a role in the production of this report. Although the communities discussed and the local officials alluded to in the case studies are either given pseudonyms or disguised, their cooperation in the Center's field work was essential to the success of our overall research and the particular work reported in this volume. Our appreciation for their help is acknowledged.

Last but not least, I want to thank the National Science Foundation for the funding it provided by way of grant PFR-7714445 which enabled the Center to undertake its research on "Socio-behavioral Responses to Chemical Hazards". Similarly, the initial and continuing encouragement of Dr. William Anderson, the Foundation's program officer for this study, is greatly appreciated. Of course, the observations and findings in this report reflect the views of the authors, and nothing said necessarily represents the position of the National Science Foundation.

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CHAPTER I.

INTRODUCTION

In this chapter we do the following: (1) indicate the intent of this report; (2) describe the phases and objectives of the overall study of which this publication is a part; (3) detail the field work procedures and operations used to gather the data for this report; and (4) conclude with an outline of the rest of this volume.

Intent of This Report

This is an unusual report. The following chapters constitute a set of case studies describing the actual state of chemical and related disaster preparedness in three American communities at the present time. There are a number of other publications which discuss what local community chemical disaster preparedness should be like. In general, they describe what ought to be, the ideal which should be sought. There is very little literature, however, which describes actual states of community preparedness as this report does. Thus, this underlies the unusualness of this publication (See also the related DRC publication by Tierney, 1980).

This emphasis on reality, what exists in everyday life, is quite deliberate. It is an effort to give readers of this report a picture of what local officials actually have to cope with in different kinds of communities, for example, political considerations or the dominance of the chemical industry in the life of a particular area. The perspective is not a model of what should be done, but rather a depiction of the kinds of community contexts which prevail and within which disaster planners and emergency operational personnel have to act. As such, the case studies are not prototypes to be followed, but portrayals of the kinds of social settings in which all preparedness decisions and actions have to take place.

In none of the three communities described in the case studies, could it be said that there is good overall community preparedness for chemical disasters. However, the aim of this presentation is not to discourage local community officials or to suggest disaster planning is impossible. Rather by noting the difficulties and by indicating they stem from organizational structure and community contexts, we think we offer a positive starting point. To understand the realities of a situation is better than assuming an ideal but unreal setting. The reality is that there are all kinds of obstacles and difficulties in actually initiating or extending community chemical disaster preparedness. Awareness and acceptance of this fact is an important first step in understanding appropriate planning. Too many model disaster plans assume, implicitly at least, that a planner usually has full or substantial control over the planning situation. This is not so, and the earlier and the more frequently it is recognized, the better it will be.

Furthermore, recognition that planning problems stem from inherent organizational and community characteristics should be helpful. Often in the

planning literature there is an assumption that difficulties in implementing planning may stem from "personality" problems, or that the planner is primarily to blame if things do not get done. Our case studies suggest that often the source of the difficulties must be sought beyond the particular people involved; for example, they may stem from some inherent conflict in American society between certain private sector interests and values and those prevailing in the public sector. Planners are not responsible for this, but they can do their job better if they recognize and accept that such social structural conflicts are a real part of the world in which they must operate.

In presenting our case studies we hope to depict both general and specific aspects which may affect community chemical disaster preparedness. Certain common themes, which will be made more explicit in the last chapter of this report, cut across all the case studies. On the other hand, there may be certain differences in community characteristics, for instance, which may raise questions in an official's mind on how applicable any given case study may be to his or her community.

For example, there is considerable variation in size and in the saliency of the local chemical industry in various communities in the United States. We therefore selected three rather different kinds of communities around which to develop the case studies. The first case study of Swisher involves a relatively small locality in which the local chemical plant tends to dominate the town life. The second case study of Gabor is about a moderate size city with a very large chemical industry in the surrounding area. The third case study is of Johnson, a metropolitan area with many scattered chemical plants and complexes. Therefore, officials from a town, a city, or a metropolitan area and from localities where the chemical industry is of different saliency, should find at least one of the case studies somewhat approximate to their own specific situation.

The communities described in this publication are not specifically identified, and pseudonyms are assigned to each locality, and even to some of the organizations and officials discussed in the case studies. The anonymity is provided for two reasons. In part, it is done so that a reader will primarily think of the general questions and issues raised by the case studies instead of becoming concerned with the specifics of particular localities with which there might be some degree of familiarity. Also, by masking the identities of the communities, it becomes possible to more clearly depict the conflicts, pressures, etc. which do affect chemical disaster preparedness, a major but not the only focus of the overall study DRC is undertaking on chemical disasters.

Phases and Objectives of the Overall Study

In the last two decades, considerable systematic and comparative research has dealt with human behavior in and group response to natural disasters such as earthquakes, hurricanes, floods and tornadoes (See Quarantelli and Dynes, 1977). These studies have been done by social scientists in the United States and increasingly elsewhere. They have shown that there is

misunderstanding about human reaction to extreme stress situations and the kinds of organizational problems encountered when mobilizing for and reacting to mass emergencies. The uncovering of mythologies and incorrect opinions has led to improved disaster preparedness measures and more efficient recovery steps being taken in the event of threats and dangers arising from natural agents, the so-called "acts of God." (See Dynes, Quarantelli and Kreps, 1981).

Research efforts are now being initiated on another general class of disasters, those brought about by human error or technical failure and accident. In line with this new interest in technological disasters, DRC obtained a grant from the National Science Foundation to undertake a three-year study of disasters resulting from dangerous chemicals or toxic substances. The research is focusing on organizational and community preparations for, responses to and recovery from relatively sudden chemical disasters.

The study is, in part, examining similarities and differences between the human and group aspects of natural disasters and those of chemical disasters. An effort is also being made to identify the distinctive characteristics of organizational and community preparedness measures for and emergency responses to the sudden release of hazardous chemical substances. Most importantly, DRC is looking at the conditions and circumstances responsible for the social features observed in acute chemical disasters. The findings of the study are intended to help bring about improvements in preparations for and responses to an ever-increasing threat and danger in industrial and technological societies.

There are three phases to the DRC study. The first phase has been completed. It focused on preparedness planning for disasters involving suddenly dangerous chemical agents. Some of the observations and findings from this work are presented in the report. The second phase of the study, beginning in September 1978, focused on the emergency time period of actual incidents involving chemical hazards. This research involved on-the-scene observations and in-depth field interviews with public safety, governmental, industrial, and community groups and agencies involved in responding to a sudden chemical disaster. Nineteen actual events in all have been studied up to the present. The third phase of the DRC research concentrates on the longer run consequences of, rather than the emergency time response to, sudden chemical disaster. An effort is being made to trace the effects of recovery from such a disaster on organizational and community planning for mass emergencies over a period of time. This is necessitating periodic revisitation of DRC to some selected localities previously experiencing major chemical catastrophes.

The DRC approach in all three phases is to obtain an objective picture of preparedness for, response to and recovery from acute chemical disasters. As is always the case in any DRC research, we are not concerned with technical issues, questions of blame, or any "investigations" of the situation since such matters are not within our research objectives. However, DRC is interested in not only obtaining knowledge but also distributing its research findings and their implications to potential users. This publication is one

of the efforts being made to disseminate information to those officials and agencies with policy planning and operational responsibilities in sudden community-wide emergencies, especially those created by dangerous chemical agents. Other activities of this nature are reported elsewhere (See Gray and Quarantelli, 1981).

First Phase Field Work Procedures and Operations

During the first phase of the study field work focused on community and organizational preparedness and planning for sudden disasters, including those involving toxic releases, explosions, or other chemical agent emergencies. Our research objectives necessitated picking a sample of communities, deciding on what organizations and personnel within them to contact, determining the nature of the information required by our research objectives, and designing the field instruments. In addition, we had to plan for, and in fact, did undertake some field studies of actual disaster events involving chemical agents.

Many factors were considered in selecting the 19 communities finally chosen for study. In order to achieve some variation in our sample selection, the following criteria were used: size of community, region of the country, concentration of chemical companies, transportation facilities, previous disaster experiences, ownership pattern of local manufacturers and types of chemical products. In addition, we needed samples which would reflect different state regulations and enforcement practices with respect to the production, distribution, transportation, and storage of hazardous chemicals. Thus, we selected three communities in each of three states with different sets of regulations and practices. In the event that everything else was roughly equal, we chose communities in which the Center had done some previous field work since that allowed us to draw on previously gathered community and organizational data with respect to disaster planning. In all, 19 communities in 12 different states were studied.

Within each community, six organizations were examined so that a picture of the overall disaster planning in the locality could be obtained. Those chosen were the office of civil defense, the police department, the local Red Cross chapter, the local EPA office, the major general hospital in the area, and in localities with harbors or waterways, the Coast Guard or the port authority. Other organizations contacted, more for their own rather than overall disaster planning, were the city and county fire department, the sheriff's office, the public health department, the office of mayor or city manager, the local state police post, utility companies, the National Weather Service station, labor unions, mutual aid organizations and the office in charge of railroad yards in the locality. Finally, a sample of facilities which process, manufacture, use or transport large amounts of hazardous chemical materials was taken with the choice of particular companies being made on the basis of the specific information and knowledge obtained by the DRC field team studying the community. In all organizations contacted, the key officials who were knowledgeable, responsible or defined as primarily concerned with disaster planning, were normally interviewed.

Three different interview guides were used depending on the organization being studied. In general, most officials were asked to fill out a

probability scale for their area, i.e., to make an assessment on a 0 to 5 scale of the probability of their locality being hit by one of 36 different kinds of possible natural and technological disaster agents. The interview guides themselves tapped the major dimensions of our theoretical model, namely, such matters as threat demands, resource capabilities, social climate, social linkages, disaster planning, and feedback processes. Generally, we wanted to know who had responsibilities for what disaster tasks, what were the relationships and the cooperative and conflicting interactions of various emergency related community groups with one another, and what was the specific disaster planning of each organization contacted. The intra- and interorganizational safety and disaster planning of chemical plants was a particular point of focus. Information was often obtained in tape-recorded interviews. The interviews were supplemented by relevant community and organizational documentary data such as disaster plans and lists of resources allocated for crisis planning. Also collected were statistical data such as records of prior emergency experiences and frequency of drills and rehearsals for sudden threats and dangers.

Although our focus was on planning and preparations for disasters, DRC also studied a few actual chemical disasters in the first year of the research. Among the events examined were threats and disasters from chemical agents in Waverly, Tennessee; Youngstown, Florida; Midland, Michigan; Texas City, Texas; Mansfield, Ohio; and Baton Rouge, Louisiana. Although our study of these events was not conducted on a large, systematic scale, we examined the relationship of disaster planning in the involved communities to the organized response to threats and dangers that developed in each particular event.

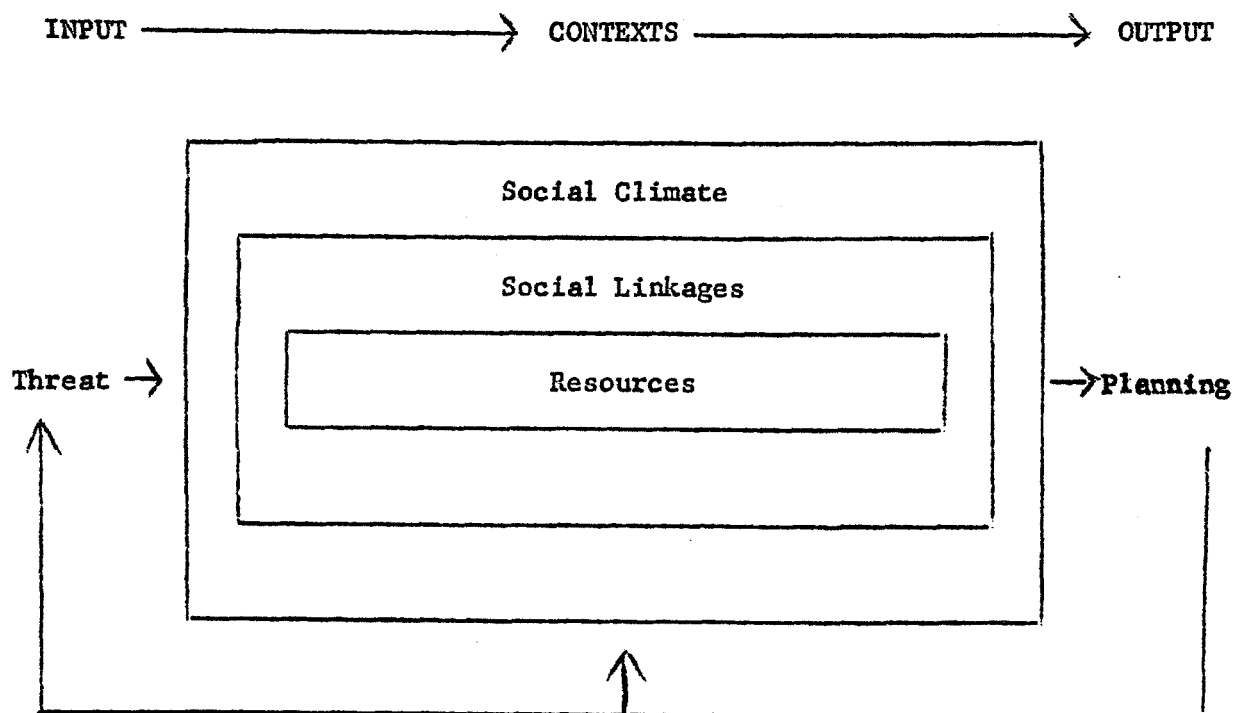
The field operations went very well. Almost all organizations cooperated fully. Direct refusals to participate in the research were almost nonexistent, thus allowing an average of several dozen groups and agencies to be studied in each community. The vast majority of officials contacted were cooperative in providing information and documentation. At the conclusion of this part of the field work, DRC had obtained several hundred interviews along with a considerable quantity of supplementary data.

For each community or event studied, a preliminary field trip report was prepared. Each report covered disaster threat possibilities in the community or the actual disaster event, organizational involvement in disaster preparations, the field teams' general impressions or observations relevant to our research objectives, any problems in field operations which might have affected the data collection, and a listing of the data obtained. These preliminary reports were used to select the case studies developed in this volume.

The case study descriptions must be seen in the context of the working model we used to gather and analyze the data on community and organizational disaster planning (for further details see Quarantelli et al, 1979). Our working model assumes that for any given community there is the possibility of some kind of danger (by chemical and other threat agents). These threats can be seen as representing the input or demands on the community for disaster planning. However, within any given community, there are always some capabilities for meeting such demands. These can be thought of as the physical and material resources which can be brought to bear to meet the demands. The resulting balance between threats, i.e., demands and resources, i.e., capabilities is reflected in some mode of social organization at the community

level, i.e., a particular pattern or set of links among the organized elements involved in disaster planning in the community. The specific form that the social linkages take is a matter of empirical determination. It may, for example, take the form of a system, a network, a cluster or a fragmented set of social units prepared in varying degrees to respond to a disaster. In turn, different social, political, economic, legal, historical, or psychological conditions affect the social linkages and resources which are likely to be present in any given community. Such conditions can be thought of as the social environment or climate. Whatever the particular constellation of elements in any given community, one outcome or output is some kind of disaster planning. The planning may include meetings, rehearsals, drills, memo of understanding as well as written plans themselves. In turn, the planning may feedback affecting not only demand threat possibilities, but also the resource capability, the social organizational pattern or the social linkages, and the social climate conditions.

In graphic terms, the model we are currently using, is presented below. Resources, social linkages and social climate are respectively depicted as being within the context of one another. This is an effort to indicate the more abstract nature of the phenomenon as one goes from resources to social linkages to social climate.



Outline of This Report

The next three chapters present the three case studies. Each case study is roughly organized in the same way. Following a description of community characteristics, the disaster vulnerability of the town, city or metropolis as perceived by local officials is depicted. A history of local disaster

planning, with a focus on chemical threats, is presented. This is followed by an overview of current community disaster planning and discussions of particular emergency organizations such as police and fire departments. Each case study concludes with a brief set of general observations and implications derived from the study for local community chemical disaster preparedness.

The report concludes with a final chapter which presents major overall impressions and some implications. These impressions, while primarily drawn from the case studies, also take into account the larger research effort of which this report is only a part. They are used to draw some positive implications for local community chemical disaster preparedness.

CHAPTER II

DISASTER PREPAREDNESS IN THE TOWN OF SWISHER

The town of Swisher is described and analyzed in this chapter. Swisher is a small town of less than 40,000 people marked by the presence of one very large chemical concern. The kind of dominance which one company has in this locality exemplifies a situation which prevails in dozens of small American communities, although the particular industry that is prominent varies considerably depending on the region of the country involved.

Community Characteristics

Swisher is located in the east central section of a northern state approximately 20 miles from a port and about 120 miles from a major metropolitan area. The town is part of a tri-town area which is the major resource and employment center for the sparsely populated rural area of the state. One airport is shared by the three towns. Most of Swisher lies to the east of a river which is joined from the west by another river near the central business district of the town. The land around Swisher is flat, relatively wooded countryside, having many lakes and forests which are heavily used for fishing, boating, hunting and skiing.

The town covers approximately 30 square miles. Besides a typical downtown central district, there are about five other shopping clusters serving not only the town residents but another 80,000 people in the country. Although it is mainly a residential community, a very large chemical complex occupies the southern part of Swisher and is relatively separate from the rest of the town. The complex, all within the town's boundary, is part of a multinational chemical concern, GEM Chemicals, Inc. Among the units in Swisher are the international and administrative headquarters of the chemical corporation, some of its multi-product manufacturing facilities and several dozen of its varied laboratories.

The town makes up about a third of the total county population of about 120,000. Both the town and the county are among the fastest growing areas in the state although in both cases the population growth has been less than 10 percent over the last decade. The population of both the town and its surrounding area is overwhelmingly white (about 99 percent), relatively young (only about 6 percent are over the age of 65), and rather well-educated (over a third of the town's population has had a college education and even the county's mean year of schooling is almost twelve years). The latter figures, of course, reflect the professional and specialized personnel required by the local chemical industry.

Politically, Swisher has a council-manager form of local government. Five council members are elected by wards for 2 year terms. The council selects the manager for the term from among its members. The manager may vote on all council issues. Neither major political party is clearly dominant, although the Republican party tends to be better represented. In recent

times, the town leadership has been very stable. Most of the town council and higher administrative personnel, as well as the sheriff and fire and police chiefs, have held their positions for ten years or more.

The county is governed by an 11 district board of commissioners. Swisher has a very dominant role in the county because it is the county seat and has the largest concentration of population (over 1,000/square mile compared to under 150/square mile for the county) and is one of only three incorporated localities. Because of this, there are close governmental and political ties between the county and the town.

The state government is divided between the major political parties. The governor at the time of the study was Republican with the legislative majority in both houses being Democratic. However, recent governors have come from both parties, and the state has not voted consistently for Presidential candidates from one party for several decades. Although in recent national elections over 90 percent of those eligible have voted, Swisher does not appear to be particularly important or influential at the state level.

The dependence of Swisher's economy on the large chemical company located there cannot be overstated. The two largest employers in the area are the GEM Chemicals, Inc. and another corporation which is jointly owned by the chemical company and a large national glass company. The two companies together employ more than 12,000 people out of a total work force of almost 24,000. Approximately, 6,500 are employed at the chemical plant (almost 4,500 hourly and about 2,000 salaried). The remainder are employed at the jointly-owned corporate and the chemical company's international corporate and U.S. division headquarters. The next largest employer is Swisher's hospital center with over 1,000 employees. No other organization employs more than 500, and there are only two other groups in the county which employ between 100 and 500 workers. The chemical plant generates more than \$400,000 annually in the area economy. Some perspective might be gained by noting that in a recent year, total retail sales for GEM Chemical, Inc. amounted to over \$200,000,000.

Largely because of the chemical company, Swisher has the unusually high percentages of almost 47% employed in manufacturing and around 45% in professional managerial. In a recent year, Swisher had an unemployment rate of under 5%, compared to the national average of over 7%. Both the household and the per capita incomes were nearly \$1,000 over both state and national averages. Over 40 percent of the households at that time had incomes between \$15,000 and \$24,999 (almost 5% had less than \$9,999; almost 12% between \$10,000 and \$14,999; and around 19% more than \$25,000).

The chemical plant occupies over 1,500 acres of an approximately 4,500 acre site on the extreme southern edge of the town. This location is not far from the nuclear plant currently under construction. Adjacent to the southeast corner of the huge plant, where the actual chemical production is carried out, are the buildings of the chemical/glass corporation. Among dangerous chemicals produced are chlorine, various pesticides and herbicides, benzene products and different caustic sodas and solvents. South of this complex is a large building owned by another chemical company but which has been vacant for several years.

Within the chemical complex alone, there are more than 800 miles of roadway, 45 miles of railroad track and 46 miles of mostly underground pipeline. Elsewhere in the town, there are an additional 125 miles of streets and the track lines of two major railroad companies. There is very heavy traffic into and from the chemical complex both by rail and road, with particularly heavy usage of those streets leading to the major north-south highway in the state about two miles east of Swisher.

Community Disaster Vulnerability

During the past 20 years, Swisher has suffered two major disasters. A few years ago, a chlorine release at the chemical plant injured several workers and forced the evacuation of homes in a nearby rural area. Fortunately, the wind shifted and kept the cloud away from the town. A recent blizzard, which paralyzed most of the midwest, also struck Swisher. A storm produced 50 to 60 mph winds, approximately one foot of snow, and temperatures which dropped from 40 degrees F. to sub-zero in less than 24 hours. Injuries were minimal, with two or three deaths conceivably being storm related, but a massive recovery effort was necessitated.

There has been a history of tornado activity in the area around Swisher, but the community has not directly experienced one. Yet, it was clear from interview and other data that the single agent which most concerned public agency disaster planners was tornadoes. The worst case scenario visualized was that of a tornado which would hit both the town and the chemical plant causing a release of hazardous materials.

The perception of public officials, as shown by their rankings on the disaster probability scale, is instructive. Tornado and blizzard tied as the most expected agents of disaster; the high rank of the latter perhaps attributable to the recent experience (note that ice storm is ranked third). Other agents were ranked in the following order: chemical spill; major frost; hail storm; a tie between electrical blackout and major auto pile-up; plane crash; and a 3-way tie for ninth between toxic release, chemical plant explosion and river flood. It is interesting that, despite the recent chlorine incident, toxic substance release is ranked relatively low. Possibly, the company's non-notable incident record prior to that time has impressed itself on the officials. Public officials also indicated that they generally thought the population at-large was far more concerned with possible tornadoes than with a dangerous incident at the chemical complex.

Any systematic comparison of the perceptions of officials from the public and private sectors is precluded by the presence of very few officials from the latter in the study. However, as is typical in such comparisons, the private sector officials consistently assigned lower probability scores to almost all disaster agents than did public officials. One exception was the slightly higher rating of a pipeline explosion by the private sector although even this higher rating is low relative to other agents. In the context of interview remarks, chlorine was singled out as the most hazardous chemical at the chemical plant, apparently because of the large quantities of the substance which are handled.

Resources

Local Resources

As will be discussed later, there is a city-county disaster plan. A newly established office of emergency services (OES) involves county and city agencies. It has an office in the town manned by one full-time person.

The emergency operations center (EOC) is in the basement of the town hall. This building houses the offices of the county commissioners, the mayor, the sheriff's department and the police department. It is across the street from the office of emergency services and a few blocks from the central fire station. The basement also houses the dispatch center for the police and sheriff's departments. In the event of an emergency, the sheriff's department becomes the communications center for the community. Recently purchased equipment allows the dispatcher to broadcast simultaneously to all radio cars in the county. This center has either radio or telephone communications with all the disaster-relevant organizations in the community.

The town's police force has over 40 officers and per capita department expenditures of about \$30. The police force ratio of 1 officer per about 900 residents compares to the average of 1 officer per about 540 residents for towns in the state with populations of 25,000 to 49,999. Under 10 of around 15 such towns have better police/resident ratios. Rather remarkably, Swisher is the only town of its size in the state whose department has a SWAT team and a special executive escort team. However, the department's equipment is the usual police department equipment of vehicles, communications equipment, etc.

The town's fire department has over 45 fire personnel (1 per over 800 residents) and a per capita expenditure of around \$28.00. The average number of fire department personnel in other towns in the state with populations between 25,000 and 49,999 is one per about 935 residents. Swisher has a ratio ranking in the top five for fire fighters/population in these towns. The department has foam equipment and Scott air packs that could be used with hazardous materials, as well as its own dispatch center which has a link with the chemical company dispatcher. The county is served by several volunteer fire departments. Each one has Scott air packs and radio communications equipment that provides for communications with each other, with the town's fire department, with the hospital's ambulances, and with the chemical plant. A seminar for both town and county fire personnel was conducted by the chemical company on identification of placards in transportation incidents. Several members of the volunteer fire departments are employed by the chemical company and have some knowledge of chemicals.

Swisher's hospital center, with over 300 beds, is the only hospital in the county. It has around 70 physicians and surgeons and maintains departments to handle almost any type of injury or illness. Examples include radiology, dentistry, ER, psychiatry and two chiropractic clinics. Many of the physicians have offices in the medical center conveniently connected to the hospital. The hospital has open communications' lines with the town's fire department and the ambulance service which it operates. This service has five

advanced life support vehicles in three locations in the county, including a central location on the hospital center grounds. It has over 15 personnel, which all have EMT or paramedic status.

Despite the community resources noted above, the greatest concentration of hazardous material-relevant resources is found at GEM Chemicals, Inc. The chemical company has a dispatch center with direct communication links with the town's fire department, county volunteer fire department, town police and sheriff's departments by radio or open-line. It also has in-plant communications through both the plant-wide phone and walkie-talkie systems. The chemical plant has a health and safety department of over 200 members. This includes the following:

- 1) over 35 medical personnel, of which about 5 are full M.D.'s, working with a fully-equipped infirmary and several ambulances (not advanced life support);
- 2) a fire brigade of around 50 members equipped with the most advanced chemical fighting equipment (chemical suits, Scott air packs, foam, etc.) and trained in dealing with hazardous materials;
- 3) a security force of over 150 members;
- 4) around 20 safety and loss prevention personnel who respond anywhere in the U.S. to incidents ranging from accidental poisoning to train derailments when company products are involved or others have requested assistance.

Extracommunity Resources

There is no large mass of emergency resources of personnel in nearby towns, and there appears to be no formal contact for disaster purposes between the local groups in Swisher and any other nearby local group outside the county. The state government is fairly actively involved in disaster preparedness and attempts to encourage local jurisdictions to take initiatives in the disaster area. State government agencies are prepared to act in typical ways in case of local emergencies. During the recent chlorine release in Swisher, state police observers on the scene were in constant communication with relevant state officials to provide updated information on the situation.

Both local emergency organizations and the chemical company are generally aware of state resources with respect to disasters. As a consequence of the company's concentration and expertise in this area, little attention is being paid to these outside resources. There are and have been very few attempts to obtain much information or to develop communication ties and contacts with extracommunity resources.

There is also little interest in or involvement with potential private extracommunity resources. For example, there is an EMS Council for the part of the state in which Swisher is located. This group exists primarily to help local communities purchase EMS resources and plan and execute community-

wide disaster drills. In an actual disaster the council would send representatives to observe operations and provide assistance in obtaining resources from outside the community. However, the council is not included in the community disaster planning and relatively few emergency personnel in Swisher seem to be even aware of its existence.

There are no nearby military bases in the Swisher area. About the only military forces which could be quickly mobilized in a disaster response would be the local units of the state National Guard. The primarily tangible resources which might be provided would be personnel and helicopters as well as four-wheel drive vehicles and radio communication equipment. However, the local guard units are not included in the disaster planning of any of the local groups, and there appears to have been no contact between civilian and military authorities about the possible use of the military in a disaster in or around Swisher.

History of Disaster Planning

There have been two very distinct phases in community disaster planning in Swisher; the second is a direct result of the recent chlorine release at the plant. Until that time, planning existed more or less as a formality which was not applied with much vigor.

At the state level, one agency evolved from a World War II civil defense office and has responsibility for preparedness for a very wide variety of mass emergencies ranging from natural disasters to riot situations. Relatively recently, the state agency prepared a master disaster plan which local communities had the option of using as a model for their own plans. Local plans were then submitted, and resubmitted if necessary, until they received the approval of the state disaster coordinator in the various regions of the state.

Under state law, it is necessary to have an approved community-wide disaster plan in order to qualify for federal disaster relief funds. As a result, Swisher did have a disaster plan in the first phase. However, much of the responsibility for preparing, updating and reviewing the plan and coordinating the disaster response fell on the local civil defense director (now the director of the office of emergency services). In Swisher, this was a part-time position often filled by retirees. Swisher also suffered a rapid turnover in this position during the 1960s and early 1970s. Many directors held the position for only one year at a time. The office accomplished little, and the disaster plan became outdated and in many regards existed on paper only. People in disaster-relevant organizations knew of its existence, paid it some lip service, but disregarded it and acted on the basis of routine patterns.

There was as well a community-wide belief that "come what may, the company can handle it," even apart from an acute chemical threat. This belief was partly based on the awareness that the chemical plant, although massive, had not ever had a toxic substance release that affected the community. In addition, it seemed to local observers that the company obviously possessed

superior resources, expertise, personnel and planning. Thus, overall disaster preparedness within the community was largely passive, especially with regard to coordination and information flow.

The recent chlorine release ushered in a new phase of planning. As already mentioned, this cloud produced several injuries and forced an evacuation. It also indirectly produced the modification of the community disaster plan, which was completely rewritten. The immediate impetus for change was the public agencies' criticisms that there was a lack of information and cooperation from the company during this event. These criticisms included comments that there was a lack of notification of the release, lack of guidance on how to deal with it, and insufficient information provided during the course of the event. The sheriff's department and the hospital were particularly critical.

It was decided that there should be a meeting between company representatives and the heads of the major response agencies (office of emergency services, police department, sheriff's department, the town fire department, Red Cross, the township volunteer fire department and the ambulance services) to review what happened and suggest possible improvements. A meeting was called by the director of emergency services, largely at the insistence of the chemical company, and was held one month after the event. The problems were discussed, and it was decided that each agency would make suggestions for changes. A second critique session was held six weeks later, and the press was invited since it had also been involved with the problems. This meeting was very fruitful and produced a list of suggestions which were forwarded to the county board of commissioners. It was recommended that:

1. Three-six portable phone jacks for new phones with unlisted numbers be installed in the EOC for outside communication;
2. Remote speakers be installed (where agency leaders are stationed) in the EOC to allow contact with the dispatch center. There is already an intercom system, but remote speakers would facilitate information flow regarding the council;
3. A mobile communications can be purchased to serve as an EOC, since railroad tracks pass immediately behind the current EOC and would endanger it in the case of a derailment;
4. A press room be established to keep the media from interfering with the EOC;
5. Overhead equipment be purchased to provide a detailed map of the county;
6. A helicopter be purchased for the sheriff's department to use for emergency transport.

Also, the chemical company made an agreement to send an environmentalist to the EOC in the event of a release; this person would have communications with an environmentalist in the field. The company also agreed to send a

security agent and a public relations agent to assist in dealing with the press.

Finally, it had been agreed that the group would meet again. Although the last meeting took place in October, the next meeting was not held until May, partially because of a health leave by the director of the office of emergency services. The sheriff was particularly interested in continuing the meetings and called this meeting himself. At this point, the hospital was drawn into the meetings and the emphasis shifted to locating and listing resources and to matching resources with contacts who could authorize their allocation. Besides the above organizations, this listing in its purview included town and county contractors, the state department of natural resources, and the state department of health. (This had already been done for school buses.) The sheriff's department took responsibility for preparing the lists. At the meeting, it was also decided that some type of identification form would be provided to volunteers allowed in the disaster area.

This group took the name "Emergency Committee" and planned on having monthly meetings. Also around this time, the state disaster agency changed the format to be used in preparing disaster plans. The director of the office of emergency services began incorporating the output of the committee into the new disaster plan.

Current Status of Disaster Planning

Because of the current rewriting of the community disaster plan, which had not in its original form been rigorously applied, there is considerable ambiguity in the organizations' perceptions of disaster-relevant tasks for themselves and others. Generalizations about organizational tasks and linkages are based on the consensus of the respondents, with extra weight given to those most centrally involved in planning and responding to the recent chlorine release. There are three organizations which clearly have the major role in preparedness for chemical incidents: the town, county office of emergency services (OES), the county sheriff's department and the chemical company. The sheriff's department and the chemical company have the best overall grasp of the community's organizational response network. When the office of emergency services completes the new disaster plan and list of community resources, it will probably emerge as the most knowledgeable about community response and assume the position of leadership in community planning which the other two organizations explicitly expect of it.

Although the state disaster agency has responsibility for approving local disaster plans, the department officer admitted that he had not given attention to the planning and task responsibilities in Swisher because he was concerned with many other communities whose planning was much worse than Swisher's.

Most of the other local organizations understood planning and task assignments only to the degree in which their own operations were affected. This was the source of much task ambiguity since they defined themselves as playing larger roles in their main activity areas than was perceived by

others. This was particularly true of the police department, which considered itself to be more involved in the primary response than it is. An exception was the ambulance company, which had an unusually clear perception of the overall response network for an organization which was not one of the primary planners.

As indicated above, the major disaster-relevant task of the OES is the rewriting of the disaster plan. During an actual disaster, its primary role is to see that necessary contacts are made. Though much of the actual contacting will be done by the sheriff's department, the decisions regarding contacts are part of the role of coordination. Much of the coordinating will be done by the director of the OES, although the sheriff, the fire chief and the police chief will also play important roles.

Many of the sheriff's department's tasks have already been touched on in one way or another. Basically, these include operating the EOC communication center, backing up other agencies in whatever way it can, and aiding in the coordination of the response. With the only possible exception of the chemical company, this department has the most diverse and encompassing tasks of the organizations involved. Because it is the designated communications center, its linkages include more emergency-relevant organizations than any but the OES.

The chemical company does very extensive planning and is probably the most knowledgeable organization involved with chemical threats. The corporate headquarters provides some guidance for planning and encourages consistency in its plant network, but it does allow plant autonomy in the writing of plans. Like other plants in the corporation, the plant in Swisher has a "unit plan" (i.e., emergency plan) intended to cover all contingencies: type of accident--explosion; gradual leak; etc.--and amount involved on every product made. There is also a plant-wide emergency plan. The primary responsibility for responding to and containing a release lies in the area of the plant in which it occurs. The supervisor and employees in that area have been trained for these activities. If more resources are needed, the supervisor calls the plant dispatcher on the in-plant phone system. As a back-up, there is also walkie-talkie communication throughout the plant which is monitored by the supervisor. Furthermore, the plant emergency manager and emergency coordinator are on-call for this eventuality.

If community assistance is needed, the company dispatcher will make the necessary connections. Because the company fire brigade routinely backs up the town fire department and vice versa, there is direct radio communication between the dispatchers. They are in almost daily contact so this link is well established. There is a similar arrangement for security, with direct and open telephone lines between the company dispatcher and the police and sheriff's departments. Again, contact here is almost daily, though not as often as with the fire department. Another community link is with the office of emergency services, which is, however, mostly limited to the monthly emergency committee meetings.

Outside the community, the company has many contacts in the chemical and transportation industries. However, the company probably possesses as much

expertise in this single plant as any information source elsewhere. Thus, although it does not ignore outside agencies, the company tends to view itself as self-sufficient. Similarly, the local disaster-relevant organizations are aware of such information sources as CHEMTREC, but they are clearly willing to rely on the expertise at the local chemical company.

The safety supervisor and his assistant coordinate with and assess the preparedness of each production unit in writing the unit plans which must be updated annually. Each department must have one disaster drill per year; the timing of these drills is staggered throughout the year so that the safety supervisor can observe and critique them. There are also two or three major plant-wide drills per year. As a result, there are three or four drills per week occurring throughout the plant. However, the company does not participate in disaster drills with community organizations.

It cannot be over-emphasized how self-sufficient the company regards itself, or how dependent the community organizations are on them for information, resources and personnel. Of course, as already mentioned, these conceptions and arrangements produced the problems in the response to the recent chlorine release. Community dependence on the plant is so profound that local planning for toxic materials begins with what the company can do for the community and then proceeds to inquire, after the company has done all it can, what do we do?

The major tasks of the local police department are traffic control and security within the town limits. Both by common consensus and in the newly formulated plans, security in the affected area would also be a primary task of the police department in the event of an evacuation and/or quarantine. Additionally, police would assist the fire department and/or the sheriff's department in both warning residents and evacuation, if necessary. The department would also establish a pass system jointly with the sheriff's department. For all of these tasks, the major coordinative links are with the office of emergency services and the sheriff's department. According to the new plan, the police would be one of the first public organizations contacted by the company dispatcher if there is an in-plant event likely to affect the community.

The department, as well, has an internal written disaster plan, to be initiated by the highest ranking officer on duty at the time. The major provisions call for mobilization of the departments, contacts that must be made, and general guidelines on distribution of personnel to meet its responsibilities. (The plan was put into effect during the recent chlorine release). The police have their own dispatch center located down a short hall from the central dispatch center in the sheriff's department. The department also has a direct, open telephone line with the chemical plant.

The town fire department's major task is to fight fires; however, the fire chief also has the legal authority to order an evacuation. Assistance in evacuation procedures and in search-and-rescue would be provided by the police department, and the sheriff's department personnel may give emergency first-aid on the scene. All of the above either are or will be incorporated into the new plans.

The fire department's link with the chemical company is more highly coordinated than that between the company and the other community organizations. It has become established procedure that the company fire brigade assists the local fire department with fires in town, and Swisher assists the company brigade with fires within the plant. Thus, patterns of coordination have become routine through actual practice. In the case of a chemical release in Swisher, the town fire department will depend upon the chemical spill training and experience of company personnel. This includes identification of the agent involved. The town fire department's role in this case would be hosing down the spill area once it is deemed safe. There is a direct radio communications link between the company dispatchers and the fire department.

It should be noted that the fire department's tasks and linkages are centered around the immediate requirements deriving from fires. Handling such tasks requires less dependence on external assistance than tasks handled by other organizations (e.g., the sheriff's department must coordinate with many organizations in disaster situations). Though the department's function is of great importance, its independent operation in controlling one primary task tends to require a lesser role in planning than its function would imply.

The fire department has a written disaster plan. It is relatively brief. However, only at the time of the DRC visit was a section on hazardous materials being written.

The area volunteer fire departments have an "unwritten working agreement" on mutual aid (as well as an open phone line) with the company. They are to be contacted by either the town police or fire departments as needed.

The two major tasks of the hospital center, the only one in the county, are care of the injured and triage. Its major linkages are with the town police and fire departments by means of an open telephone line. The state police are also on the hospital's disaster call-up list. In terms of disaster preparedness, one notable weak linkage is with the chemical company. As noted, there was a communication problem during the recent chlorine release. In addition, it was mentioned that the company medical staff is reluctant to assist at the hospital. This problem has not been resolved.

Although the hospital is included in the community-wide planning, the most relevant planning for the hospital is its own disaster plan. Since community planners are willing to allow the hospital to go its separate way, the hospital's plan covers both internal and external disasters and applies to any type of disaster agent. The hospital holds its own disaster drills every six months and participates in the community-wide drills conducted annually by the EMS council of the eastern part of the state. These drills usually are for natural disaster agents though plane crashes have been included.

The ambulance service is operated by the hospital and is included in the hospital's disaster plan. This service covers the entire county. Although it is a part of the hospital, the service's major external link is with the sheriff's department. (The routine handling of traffic accidents is the basis for its actions in a disaster.) Its major task is the transportation of victims although all of its members have EMT or paramedic status. Under state

law, the individual with the highest emergency medical training (in any medical emergency) is in charge of on-scene operations as long as the injured remain there. This generally is the ambulance service personnel. Ambulance service personnel could become involved in the handling of radioactive materials in conjunction with the hospital's radiology department as outlined in the hospital's disaster plan.

The major tasks of the Red Cross are providing food, clothing, shelter, and first aid treatment. The Red Cross would also work with the town police and sheriff departments in compiling lists of missing persons. It has organizational linkages with all the community disaster-relevant organizations although in the case of a disaster it would most likely be notified by the fire department. It has a written disaster plan based on national Red Cross guidelines. The Red Cross also participates in the EMS council drills for the eastern part of the state.

Other organizations included in the current disaster planning are the department of public works, the road commission, the department of water, the health department, the social services office, local CB organizations, and the central state Amateur Repeaters Association (ARA). The plan lists their resources, services and contacts. Of the organizations, the ARA is the most notable because it has an emergency coordinator and call-up list for use in the event of a major disaster. This organization was very active in the response to the recent blizzard.

The U.S. Weather Service, is not involved in disaster planning in Swisher and was not involved in the recent chlorine spill response. In case of an impending tornado, it would broadcast warnings over the weather radio and the weather wire service. Except for this connection, none of the mass media organizations in Swisher are involved in any way with community disaster planning.

Although the railroads have their own disaster plans, these have not been integrated with other local community disaster planning. In fact, there does not appear to have been any recent communication or contact between the railroads and local groups about this matter. Also, none of the numerous trucking concerns involved in the transporting of materials and goods to and from the chemical company seem to have any connection whatsoever with local disaster planning.

General Observations and Implications

Overall, Swisher is poorly prepared for disaster in general. Even if all plans are written as projected, the community will not be well prepared for the full spectrum of potential hazards. The town is in a much better position with respect to an acute chemical threat since GEM Chemicals has an excellent internal disaster plan. However, the present relationship between the community emergency organizations and the chemical plant is not that good with respect to planning for a chemical threat to the town. Thus, if an acute chemical emergency were to extend beyond the plant and company boundaries, there would undoubtedly be serious difficulties and problems in responding.

Certain factors in Swisher have been very influential in creating the current state of overall and chemical disaster planning in the community. Some of these factors are historical and have had a direct effect. Others have to do with the dominance of the chemical industry in the area, with the effects being more indirect.

Insofar as overall community disaster planning is concerned, major focus is on particular natural disaster agents such as blizzards and tornadoes. Disaster-relevant town organizations and officials believe these are the potential disasters which may threaten the community. These are perceived as most likely to occur because there have been threats of this nature in the recent past. The general impression is that if these historical incidents had not occurred, almost no community disaster preparedness would have been undertaken.

But this stance has also been indirectly reinforced by the dominance of the chemical company in the community life. Swisher is not strictly a company town as that term is usually understood, but it leans in that direction. The town is generally dependent upon GEM Chemicals for its well being; it is similarly dependent upon it in regard to disaster preparedness. The blizzard and the tornado nudged the community a bit towards independent and overall planning, but there is still an implicit belief that when all is said and done and if worst comes to worst, the company will be able to help the community irrespective of the disaster.

The dominance of the company also accounts for an almost hands-off community policy with respect to the possibility of an acute chemical emergency threatening the town. In Swisher, as elsewhere, the local chemical industry may be well prepared to handle plant emergencies within its confines. But as elsewhere, little consideration has been given to the coordinated plant-town preparations and responses necessary for a threat which might go beyond the plant gate. Although the recent chlorine release episode also stirred the emergency organizations in Swisher to do some planning if the community were threatened by an initial in-plant emergency, the preparedness steps taken so far are rather minimal.

The future appears to be not much different from the past. There may be improvement in some disaster planning in Swisher and in plant-town linkages, but the role of the chemical company will not be any less important. In fact, GEM Chemicals may become even more influential in disaster planning. For example, future plans by the company include the installation of a new computer and terminal in the plant's dispatch office which will perform two tasks. One function will be identifying fire hazard and evacuation areas from information on chemicals involved, amount released, and wind speed. The information obtained will be forwarded to public officials. Another function will be locating resources available and possible contacts from complete lists which will be stored in this computer.

All this will strengthen the link between the public and the private sector in Swisher with regard to preparing for and responding to acute chemical emergencies. But it will leave the town even more dependent upon the chemical company for chemical disaster safety and security, and it does

nothing at all for disaster planning for non-chemical kinds of disaster agents. Little incentive is provided to the local emergency organizations to do their own independent planning or to concern themselves with the full spectrum of disaster hazards.

CHAPTER III

DISASTER PREPAREDNESS IN THE CITY OF GABOR

In this chapter, the city of Gabor is described and analyzed. It is an intermediate-sized community on the lower side of the 100,000 population range. Along many lines, Gabor is typical of American communities which have a range of industrial and other work activities but include a concentration of chemical plants within or around their corporate boundaries.

Community Characteristics

The city of Gabor is near the geographic center of the state. Located at the junction of the Red and Grand Rivers, this region is characterized by semimountainous terrain. The Red River winds through this terrain in an east-west direction and is the site of most of the area's industrial plants. The valley contains abundant deposits of coal, timber, salt, oil, water, natural gas, clays and silica sands which make it an ideal location for chemical manufacturing.

The Gabor Standard Metropolitan Statistical Area (SMSA) occupies more than 1,200 square miles of land, spreading horizontally across the northern bank of the Red River. The city is located in the center of the industrial belt which extends for approximately 30 miles along both sides of the river. The semimountainous character of the surrounding area makes the dispersion of industrial emissions difficult and, thus, causes Gabor to have sudden temperature inversions, heavy precipitation and air pollution problems.

Gabor is one of the biggest cities in the state. However, in recent years, the city has not been growing; in fact, the present day population is less than that recorded by the 1970 census.

The 1975 population of Madison County in which Gabor is located was over a quarter million. It should be noted that an extremely small segment of the city also extends into Washington County. The city's population density, over 2,500 persons per square mile, is over ten times that of the county as a whole.

Gabor and the remainder of the county also differ in terms of the racial and age distributions of their respective populations. More than a tenth of the city's residents are non-white (predominantly native blacks) as opposed to only half that number in the entire county. In general, the population of the city is older and better educated than that of the county.

The major responsibility for the operation of the Madison County government rests with a three-member commission, with other elected officials serving as assessor sheriff, prosecuting attorney and circuit court judges. All three commissioners, as well as Gabor's mayor, are members of one of the major political parties. While the state in national elections has traditionally voted for that party and the state legislature is dominated by that same

political party, the governorship in recent times has been occupied by politicians from both major parties. Many of the state legislators are wealthy industrialists--indeed, one half of them are reputed to be millionaires and a few are environmentalists. A pro-industry climate was perhaps reflected in a recent gubernatorial election when a candidate running on a specific pro-ecology platform was soundly beaten, although before and afterwards this person was otherwise successful in winning statewide offices. The influence of the big business ideology upon the political life of the state is particularly pronounced in highly industrial areas such as Madison County.

Gabor is characterized by a multi-faceted economic base. The area's most renowned enterprises, the mining and chemical industries, actually account for a relatively small portion of the total economic activity. The sector employing the largest number of persons is wholesale and retail trade which has about a fifth of all the labor force. Next is manufacturing, with a somewhat lower percentage of all employed persons working in industrial plants throughout the valley. Although chemical manufacturing dominates this sector, metal fabrication, machinery and glass production are well represented. About one of every six persons working is in government since the city is the locale of a number of state agencies.

Gabor has a desirable location in terms of its proximity of major market areas and population centers. These markets are becoming more accessible with the development of three major interstate highway networks which converge in the city's area. Also, early in the 1970s, the city's airport was officially designated as a "Port of Entry" by the U.S. Customs Bureau, enabling the region to receive direct shipments from abroad. Similarly, waterborne commerce is extensive, the Red River basin being a major river system in the country. Commodities transported on the river include coal and coke (c. 35%); sand and gravel (c. 25%); oil and gas (c. 10%); and iron, steel and miscellaneous products (c. 30%). In addition, two of the major rail systems service the manufacturing and mining operations in the area.

The city, as measured by a number of criteria, is relatively well off. In mid-1977, its unemployment rate was less than that of the state as a whole and only 60% of the national rate. Gabor and Madison County also compared favorably with the rest of the state with respect to per capita income. In 1975, Gabor's SMSA per capita income rated highest of all the metropolitan areas in the state, and Madison County, with approximately the same per capita income, also led all counties in the state. Although this state as a whole rated considerably lower than the national average of \$5,903, the figures for Gabor and Madison County exceeded this rate.

The area surrounding this city contains one of the nation's largest concentrations of basic chemical production. Thirty plants are located within a 30-mile area along the Red River. The principal products of the area are agricultural and chemical products such as ammonia, antifreeze, chlorine and its derivatives, plasticizers, polyethylene, rayon fiber, solvents and vinyl. Of the nearly 20,000 employed in manufacturing in the region, approximately 17,000 are involved with the chemical industry. The four major employers are among the top companies in the United States whose annual sales of chemical products total more than a billion dollars yearly. These four companies alone

have six plants and other facilities in the area, with the number of employees ranging from about 650 to 5,000. The value of shipments for the local chemical industry in 1972 totaled approximately one and a half billion dollars.

Three major clusters of chemical establishments (two or more adjacent plants) can be identified in the industrial 37-mile stretch of the Red River. In the extreme western part of Madison County and extending into Washington County, four plants, including two major plants, are located within a two-square mile area. All four of them are close to residential and commercial areas. Another cluster, located on the south side of the river from Gabor, is comprised of two major facilities within 2,000 feet of one another. These establishments are adjacent to residential and commercial areas, as well as major auto routes. The third major cluster, in the eastern extremity of the industrial belt, consists of two plants (one major and the other medium-sized) which are beside one another. Although these plants are removed from populated areas, they are adjacent to a major interstate highway.

The means of transportation most often used for handling hazardous commodities in the area are road and rail. Road transportation is becoming increasingly more popular due to its greater speed and better safety record. The construction of the new interstate systems through Gabor is said to have reduced the hazard of truck transportation. Formerly, all tank trucks passing through the area were forced to travel into Gabor's downtown area which increased traffic congestion, the number of accidents and the number of citizens exposed to potential danger.

Community Disaster Vulnerability

The general region is highly susceptible to both natural and technological disasters. Four large-scale disasters have occurred over the past 20 years. Over 20 years ago, an explosion, fire and ensuing release of toxic gas leveled a good part of a chemical plant producing numerous fatalities. In the early sixties, flash flooding produced mass casualties. Approximately ten years ago, an explosion and fire at a company storage depot resulted in a massive chlorine release, necessitating large-scale evacuation of residents living in the southern part of the city. A few years ago, a major snowstorm resulted in a statewide emergency, and severe spring flooding followed. These four incidents reflect the range of threats to which the area is particularly exposed. Incidents of some magnitude involving hazardous materials and flooding occur frequently: the former on a regular basis and the latter seasonally.

The perceptions of our respondents concerning the hazards to which Gabor is most exposed are closely related to the area's disaster experience. As Table III-1 indicates, a chemical contamination or spill is ranked first based on a 1 to 5 scale. Then, in descending order, follow a major chemical plant explosion, a sudden toxic release, a flash flood and a major frost/freeze (equally expected), a major industrial explosion other than a chemical plant explosion, a blizzard and a massive automobile wreck (equally expected), water pollution and a mine disaster (equally expected) and, finally, a river flood.

The data also indicates that the public sector invariably displayed higher probability across the board for disasters than private industry. The figures based on a small sample of respondents from the private sector make the ratings of this small number of people more susceptible to extreme ratings. Notwithstanding this observation, certain other patterns are also evident from the data. The range of scores for the public sector was much narrower than for the private sector (ranging only from 3.50 to 4.50 compared to 1.50 to 3.25 except for a 4 rating for a chemical spill). The widest disparities between the ratings of public and private industrial sector respondents occurs for incidents not involving chemical hazards, i.e., river floods, massive automobile wrecks, mine disasters and non-chemical explosions. That is, officials from the public sector see these disasters as far more likely, often in the magnitude of two or more, than do individuals from the private sector. There is only a slightly higher correlation between the public and private sector in their perceptions of the probability of chemical plant explosion and sudden toxic substance release threats. Overall, respondents from the public agencies have a relatively consistent awareness of all forms of threat whereas, respondents from the industrial sector, while somewhat more sensitive to hazards posed by chemical substances, have a very low level of threat expectation outside the chemical area.

Although the data is such as to require qualitative analysis, respondents from chemical plants generally provided higher probability ratings than personnel from trucking companies hauling chemicals. There is also some evidence that chemical company personnel are more conscious of the hazards posed by plant facilities; whereas, the transporters are more aware of the threats posed by the transportation of dangerous chemical substances.

Overall, according to objective criteria, actual experience and the judgment of our respondents, chemical incidents constitute the greatest threat in the Gabor area. The hazardous chemicals used, manufactured, stored and transported in the area are not only present in high volume but in such diverse forms as to produce a high degree of vulnerability. The area has suffered several major chemical disasters, a number of smaller incidents, and even more threats. There is general consensus on perceptions of chemical threats as the more likely community dangers in the future.

TABLE III-1

N=13

	<u>Total Mean Rating</u>	<u>Public Sector</u>	<u>Private Sector</u>
Chemical Contamination or Spill	4.39	4.50	4.00
Chemical Plant Explosion	3.89	4.29	2.25
Toxic Release	3.33	4.21	2.25
Flash Flood	3.78	4.21	2.25
Frost/Freeze	3.78	4.00	3.00
Other Plant Explosion	3.56	4.29	2.25
Auto Wreck	3.44	3.93	1.75
Blizzard	3.44	3.50	3.25
Mine Disaster	3.33	3.79	1.75
Water Pollution	3.33	3.50	2.75
River Flood	3.28	3.79	1.50

Resources

Local Resources

Most community resources are mentioned in the county's emergency services agency's (ESA) disaster operations' plan, a copy of which is available to all county emergency-relevant agencies. In addition, the mutual aid council (MAC) has issued a list of resources possessed by its membership.

In terms of emergency communications, the emergency broadcast service (EBS) outlet, radio station WAVE, has primary responsibility for broadcasting warnings and public information. These warnings may originate from all three levels of government, the National Weather Service, the industrial plants, law enforcement officials and so on. More importantly, there is a communications system linking the station with the local weather bureau and the governor's office. Both of these organizations can activate the system and send recorded messages to the radio station, which are then played on the air. The industrial plants also have access to this system through the weather bureau. In addition, thirteen of these plants operate a separate hotline to expedite emergency resource sharing.

An emergency operations center (EOC) has been established in Gabor and would be staffed by representatives of all sectors with emergency-relevant responsibilities. Pre-positioned at the EOC is a list of privately and publicly owned communications equipment in the region; information relating to radiological and shelter operations; area hospitals, ambulance services, medical personnel, medical and pharmaceutical suppliers; and local mass transporters (public, private and military).

The county contains 5 municipal and 28 volunteer fire departments, as well as numerous industrial fire brigades. The municipal departments possess basic fire fighting and light rescue vehicles, as well as radiological, warning and communications equipment. Gabor's fire department possesses some foam for industrial fires. The city has one fireman per approximately 400 residents. Fire department expenditures amount to about \$35.00 per capita, giving the city 48th rank in the state. Gabor has one police officer per approximately 360 residents, with per capita department expenditures of about \$45.00, placing the city 51st in the state. The police have no specialized emergency equipment other than that used to conduct their routine law enforcement operations, i.e., motor vehicles, communications equipment, etc.

Six hospitals are located in Gabor and nine in the county as a whole. Gabor has 120 hospital beds per 1,000 residents. The city also has a public ambulance service with 28 paramedics and 8 EMT's.

With respect to welfare services, the county plan contains a comprehensive list of private and public agencies that would be involved in the assessment and fulfillment of population needs. An agreement between the state department of welfare and the local Red Cross chapter places personnel of the former at the disposal of the latter in an emergency situation. In

the event that mass evacuation would even be required, government-owned vehicles and those of the regional transportation authority would be the principal resources used.

With respect to radiological threats, the ESA has designated personnel trained and equipped to monitor and analyze radiological material, as well as to control radiation exposure and to direct decontamination procedures.

Specialized resources to counteract threats posed by hazardous chemicals are almost exclusively possessed by the industrial sector. According to the organizations' charter, each member of the MAC is expected to possess sufficient resources to deal with its own particular hazards. Beyond this, a list of members' resources are circulated to all participants. These include communications equipment; medical resources (emergency motor vehicles, stretchers, and medical supplies); respiratory protective equipment (Scott air packs, cylinders, respirators, gas masks, etc.); fire fighting equipment (suits, portable extinguishers, foams, hoses, nozzles, truck, fire brigades); marine equipment; and heavy mobile equipment.

Extra Community Resources

The state government has been extremely active in assisting community disaster planners. Its most noteworthy contribution is a resource manual formulated by a state government task force. This manual delineates the responsibilities of federal, state and local agencies, as well as military groups operating in the state in almost all conceivable types of emergency situations. Also, for each type of emergency, the resources of the relevant agencies, call lists and task checklists are provided.

Several state agencies are particularly germane to emergency response in Cabor. For example, the state police would assist local police departments in activating the local traffic plan in establishing an emergency pass system and mass evacuation. The state police would also provide supplementary communications equipment to primary responders. As mentioned previously, the state department of welfare would provide additional personnel to the community. With respect to chemical incidents, the branch of state government responsible for air pollution control could send a team of chemists, meteorologists and engineers to aid in the identification of spilled material and in the prediction of its dispersion. A corresponding function would be performed by the state government department responsible for water resources, although this agency possesses no operational response capability.

With respect to the private sector, local industry is aware of the various national and corporate information and response systems that can be consulted. Of particular interest is the locally based nationwide information system of one major chemical company which provides specialized advice and response personnel to the scene of incidents involving their products.

Gabor's location and status in the state ensure that most military-related facilities and resources available in the state would be readily available. Both the U.S. Coast Guard and the Army Corps of Engineers have units within approximately 100 miles of the city. The former, through its nationwide information service and chemical emergency response system, is particularly equipped for chemical incidents and search-and-rescue operations occurring on inland water routes. However, community liaison with the Coast Guard has been non-existent due to the minimal activity required of them so far in the valley area. The Army Corps of Engineers monitors stream flow data and community water reserves. Both the Air and Army National Guard can provide a substantial augmentation of personnel to the area within 24 hours. One of the Air National Guard bases in the state is located at Gabor airport and possesses transportation aircraft. The equipment available from the Army National Guard includes aircraft, ambulance and other motor vehicles.

History of Disaster Planning

Disaster planning in Gabor is closely related to the community's actual disaster experience. Since the late 1940s, mass emergencies have consistently been followed by modifications in response capability or even by major decision to formulate community-wide disaster plans. The emergency of operational plans for chemical incidents preceded those oriented toward other threats by almost 25 years. This is most likely due to the predominance of incidents involving hazardous materials or, at least, the greater magnitude of such incidents.

A selective examination of disasters that have occurred in the area over the past 30 years provides a good indication of the manner in which such events have influenced the process of emergency planning. A toxic spill in the late forties served as the stimulus for discussions held among the industrial community and public groups--primarily the state police--which culminated in the formation of the MAC. The next major incident to affect the area, a fire and toxic release at a chemical plant about ten years later, exposed problems relating to the evacuation of the surrounding community and convergence. The latter refers to the saturation of an impacted area by emergency response personnel and equipment, relief groups, the media and concerned citizens. Following this incident, an emergency traffic diversion plan was adopted by MAC. In the early sixties, a flash flood claiming 27 lives resulted in an improved warning system through closer community liaisons with the local weather bureau. Approximately ten years ago, an explosion, fire and concomitant release of chlorine vapors occurred at a chemical company's warehouse. The subsequent evacuation and emergency response was hampered by misleading information which the public received from the news media. Following the incident, improvements were made in communication links between the plants and the media. At a state-wide level, improvements in local warning systems were also undertaken as a result of the blizzard during the winter of 1977.

While planning for incidents involving hazardous chemicals has been comprehensive, preparedness for natural disasters has lagged behind, with county-wide operational plans being formulated only in 1975. Generally, the

participation of public agencies in overall disaster planning has been marred by widespread apathy, limited resources and the general lack of involvement of most public agencies during chemical incidents due to the self-sufficiency of industrial responders.

Interest in nuclear war preparedness waned in the late 1960s, probably reflecting nationwide shifts in priorities by federal authorities. However, planning for a nuclear episode has recently re-emerged as an area of concern. This is evidenced by extensive treatment of the problem in the county plan and again probably reflects activities at the national civil defense level.

Gabor's disaster planning, formerly the responsibility of an office of emergency services is now under the authority of the department of public safety. In 1971, the city civil defense organization (CDO) joined with its county counterpart for the purpose of resource sharing. Although separate organizations have been maintained, the county organization has been weakened by the recent death of its influential director. In addition, that organization has received extremely low funding in recent years. Consequently, the city's CDO has emerged as the leader of emergency planning in the public sector although its planning is largely confined to the city. Thus, although the county plan was largely a product of the former county civil defense director, its implementation now rests primarily with Gabor's CDO.

The other major overall planning group in the area has been the MAC. Its role as a traditional community leader with respect to emergency planning is attested to by its recognition in the county plan as having coordinative responsibility for industrial disasters. In addition, the emergency traffic plan formulated by the MAC has been incorporated verbatim into the county plan.

As is the case in the county, planning among public agencies in Gabor has tended to lean heavily upon the activities of one individual. The director of Gabor's CDO is the central figure in community disaster planning and the coordinator of disaster response for non-chemical incidents. His personal endeavors resulted in the establishment of the public ambulance service. Despite his efforts, city planning was sporadic, with improvements most frequently being made after failures in disaster response. A core of agencies accounted for the majority of interorganizational contacts (CDO, the police and fire departments) with others remaining on the periphery of the planning progress (e.g., the Red Cross, hospitals, the public health department, etc.). In addition, few of these agencies in the past developed internal contingency plans.

The industrial sector, on the other hand, has one of the first and most advanced mutual aid systems in the country. This is in addition to comprehensive internal planning by the individual plants. A minimal amount of such planning is a precondition of membership in the MAC. Although the impetus for the development of this system was principally provided by the previously mentioned toxic spill in the late forties, more basic factors have also been influential. These included the close proximity of companies to one another which creates the possibility of sequential disasters and the presence of the corporate headquarters of one of the world's major chemical manufacturers. Although the MAC has from the outset nominally included numerous public agencies on its roster, the companies, both according to design and especially in practice, have played the dominant role in terms of planning at its sessions.

Also, they have been coordinating the response for and operationally neutralizing chemical spills and fires. Historically, a tacit agreement between the chemical companies and the public emergency-relevant organizations has permitted the former to handle incidents so that industry may keep such incidents from too much public attention and scrutiny. The public agencies, faced with limited expertise and resources and the possible political repercussions of interfacing in the domain of industry, have willingly complied.

The MAC has experienced steady growth since its establishment in the early fifties. This growth stems from a reaction to problems encountered in responding to actual incidents and to their policy of enlisting a maximum number of local organizations. Although the MAC continues to expand, some of the respondents in our field study indicated that it reached its peak in the 1960s in terms of membership initiative and general expertise. The emphasis on continued growth at present may, therefore, be partly serving a public relations' function.

Current Status of Disaster Planning

Currently, two organizations are recognized as sharing major responsibility for Gabor's overall disaster planning. The public agencies in Gabor view the city CDO as having this responsibility; whereas, the industrial community recognizes the MAC. Only the city's fire department acknowledges them both as responsible for overall planning. The state department of emergency services has been named as the principal planning organization for other municipalities in the county. This is not surprising as the county civil defense office has a budget of only \$10,000 per annum and has been considered a "paper" organization since the death of its former director. Gabor's CDO, in conjunction with its counterpart in the county, has an emergency operations plan oriented toward disasters of natural, chemical or radiological origin. The plan is exhaustive, dealing with every facet of response--emergency warning, fire and rescue, policing, welfare, public information, health and medical services, transportation, traffic diversion and the provision of community shelter. Although referred to as an operations' plan, the document is primarily concerned with the delineation of local agencies' responsibilities for each task area and with the establishment of frameworks and guidelines for more detailed operational planning by relevant organizations.

In the course of planning, the city CDO meets on a daily basis with other agencies within the city which are involved in public safety, e.g., the police and fire departments and the public ambulance service, the latter being formally a subordinate unit of the CDO. Also, the local Red Cross chapter and the CDO have almost daily contact. Organizations which occasionally participate in meetings with the aforementioned agencies include the local hospitals and the state police. The CDO, police, ambulance service and the Red Cross participate in two-four disaster simulations annually, some of which are, however, initiated by MAC. Recently, more community-wide drills of this nature have been initiated by the CDO in order to provide participants with experience in non-chemical incidents such as a massive bus wreck. Very recently, the local hospitals have been included in these drills.

Although regular contact exists between the CDO and the other key emergency-relevant organizations in Gabor, the latter seem to have little knowledge of the functions and capabilities of the CDO, the responsibilities of one another, and even of their own tasks other than in general terms. This is a by-product of the lack of operations incorporated into the city/county plan, the relative absence of drill experience of the municipal agencies, the apathy of these agencies and their consequent dependence upon the CDO in a crisis situation. Neither the police nor the fire department have developed their own disaster plans and these organizations, together with the Red Cross, display a lack of knowledge of the county plan. They convey the impression that the CDO would serve as the focal point of disaster response in a non-chemical incident. Formal leadership on the part of the CDO is thus augmented by informal leadership, with Gabor's director seemingly the only official in the community who has a grasp of overall emergency-related responsibilities and resources.

Agencies in direct contact with the CDO, such as the fire department and the ambulance service, attribute to it numerous disaster-related operational functions (e.g., housing victims, stockpiling emergency equipment, search-and-rescue, evacuation, and so on), although the organization has a current per annum budget of under \$50,000 which is only enough to maintain two paid personnel and several motor vehicles. Such limited resources, at best, allow the CDO to serve as a coordinator of responding agencies rather than as a responding organization with operational capabilities. This responsibility of maintaining direction and control for all official activities in an emergency is specified in the county disaster plan.

Gabor's police, according to a general consensus of the respondents in our field study, would perform the tasks of traffic diversion, law and order, maintenance, and assistance in evacuation during emergencies. All of these are specified in the county disaster plan. The first, traffic diversion, also is given extensive treatment in the MAC plan in which the actions of all law enforcement agencies functioning in the county (the state police, the sheriff's department and all the municipal forces) are detailed. This section of the MAC plan has been adopted in full by the community planners and, consequently, is applicable for all types of emergencies. A few respondents also mentioned that the police are and would be involved in emergency warning.

Gabor's fire department performs fire fighting and light rescue operations in emergencies; both of which are specified in the county disaster plan. However, the department has no personnel with specialized expertise in combating chemical fires. It does possess some foam should this be required. With respect to industrial fires, this department, unlike some elsewhere in the county which are linked to local industrial plants via communications systems, is not a primary responder. Rather, it tends to be called in only after industrial brigades have failed to contain a chemical incident. Interestingly, Gabor's fire department does not participate in the industrial sector's drills nor in those initiated by the CDO, despite the fact that it is listed on the MAC roster and has daily contacts with the city CDO. This would suggest that this department is not seen as crucially involved in disaster operations.

Gabor's ambulance service is a creation of, under the authority of and represented by the city CDO at planning sessions. It claims to provide basic life support and mortuary services, perform search-and-rescue operations, and assists in evacuation. These responsibilities, however, are neither specified in the county disaster plan nor mentioned by other community respondents. The ambulance service does participate in the CDO initiated drills. Its personnel have no specialized expertise in treating injuries or illnesses relating to exposure to hazardous materials.

The local Red Cross chapter was seen by all of our respondents as performing its standard functions of providing emergency housing, food and clothing. These tasks are outlined in the county disaster plan. Based on an agreement with the state's department of welfare (in the mid-70s), the Red Cross would also coordinate the provision of disaster casework and welfare services using welfare department personnel as required.

The other major disaster planning organizations, actually covering a multi-county area, is MAC. This voluntary association of private and public organizations financed by industry is devoted to planning for and responding to industrial and utility emergencies. In general, full membership on the council is restricted to companies involved in the manufacture, storage, or transportation of hazardous materials and utility companies employing at least 250 people. All area chemical plants of that size are members. Three transportation companies, one railroad and two trucking companies, employing less than 250 locally, are also members. Associate membership is provided to public agencies with emergency-related functions; however, this status denies those organizations the right to vote on motions before the council although their input is, at least formally, solicited. Public participation includes the area's Red Cross chapter; the two major daily newspapers in Gabor; five local radio and two television stations; the local F.B.I. office; Madison and Washington County sheriffs; numerous municipal police departments; the state department in charge of public safety (including the State Police); the local base of the Air National Guard and the nearest Coast Guard Base; several municipal and volunteer fire departments; hospitals; the state and county and city civil defense organizations; the local forecast office of the National Weather Service; and several additional state agencies.

The objectives of the MAC, as indicated in their charter, are as follows: 1) to establish a well-coordinated and practical long-range plan for handling industrial emergencies in the area; 2) to instill public confidence in and an understanding of established emergency procedures; 3) to cooperate with governmental agencies in the event the public may be affected by industrial emergencies; 4) to encourage self-sufficiency in each industrial plant and utility installation with material assistance from others within set limits; 5) to enhance cooperative action among the industries and utilities in the area in the event of an emergency; and 6) to evaluate potential industrial emergencies and plan for mutual assistance with available materials when needed.

To fulfill these objectives, a board of directors exists consisting of several key positions with clear-cut responsibilities. Incumbents are changed on an annual basis. In addition, committees have been established to deal with specific matters relating to emergency planning and response. These

include security and traffic control, emergency communications, material assistance, risk evaluation, drills, fire protection, public relations and special services, e.g., medical and welfare services. Regular monthly meetings are scheduled for the total membership. These provide a forum for regular planning sessions, as well as for lectures by personnel from community, federal and state agencies.

Three to four disaster drills are undertaken annually by MAC members. These usually involve the simulation of in-plant emergencies. In order to provide as wide a range of experience as possible for participants, both the type of incidents (e.g., explosions, fires, toxic releases) and their locations are constantly rotated.

The two principal components of the MAC plan are material assistance and traffic diversion. For the first, a resource list indicates the organizations from which each type of emergency equipment is available. The receipt of such equipment is expedited by the hotline linking 13 of the major member companies. The traffic diversion plan involves the development of a pass system in an emergency zone to permit the entry of required personnel and resources and the rerouting of non-essential vehicles. Contingency plans have been formulated for incidents involving any of the area's chemical plants. For any major event, all three levels of law enforcement (the municipal and state police and the sheriff's department) along with industrial security personnel would be involved. The plan details the manner in which each department should deploy its personnel, for most conceivable events, both for the purpose of traffic diversion and law enforcement.

As already noted, aside from the participation of law enforcement agencies in the traffic plan, few public agencies are consistently involved in responses to industrial emergencies. Such responses, wherever possible, are undertaken by the affected company or by a group of companies when additional resources are needed. The participation of public groups in major industrial disasters is at best limited to providing support to the industrial responders, or to the fulfillment of human service tasks such as medical assistance and welfare. The actual containment and neutralization of hazardous substances is performed by industrial personnel under the authority of the affected plant's personnel. In the event that an affected plant lacks the expertise to coordinate the response efforts, the MAC's president's company assumes leadership responsibilities.

The domination of industry in the community response to hazardous materials incidents is a reflection of the planning process itself. Not only do the industrial members of the MAC have formal decision-making responsibility, but they are the ones who are regularly present at the monthly planning sessions. Representatives of public agencies, the media, the weather office, utility companies and transportation companies attend on a sporadic basis, if at all. Those present on a regular basis represent the largest chemical plants in the area, and it is this core group which directs policy for the entire organization. Due to the small size of this group, strong informal ties have developed which cement their leadership roles and make it increasingly difficult for other members or associate members to influence policy-making.

The chemical plants are recognized by most public agencies in the Gabor area for their role in the identification and neutralization of spilled chemicals. After the containment of an incident has occurred, the actual clean-up and disposal of the spilled substance(s) may be conducted by specialized contracted organizations depending upon the specific policy of the company involved.

Several companies undertake comprehensive disaster planning of their own; this is largely a function of plant size. Those companies with specialized emergency squads (e.g., fire brigades) have written emergency procedures and undertake their own drills on a regular basis. Although the extent of emergency planning within each plant differs according to corporate policy, most of the industrial respondents in the DRC study indicated that their planning was influenced most by the local climate of safety consciousness engendered by the MAC.

In keeping with the objectives of the MAC, all the stockpiling of emergency equipment is performed by the companies themselves. Each plant is expected to maintain equipment in sufficient quantity relevant to the hazards therein. Furthermore, all plants have their own emergency pass systems (personnel identification cards).

The MAC has also inspired the formation of linkages between companies wherever clusters of chemical plants exist in the area. Adjacent plants have devised mutual warning systems to offset the possibility of sequential disasters. For example, in the easternmost part of the area, two plants have established an emergency hot-line, distinct from the MAC system, through which one company is immediately notified of the other's emergency. Also integrated into this system is the local fire department, which is automatically alerted when the companies themselves become aware of the chemical emergency.

Transportation companies, whether trucking or rail, employ standard safety procedures as required by the U.S. Department of Transportation and attempt to neutralize minor incidents through the equipment available to onscene personnel (e.g., drivers). However, even the largest transporters in the Gabor area do not have response capability for major incidents involving their cargo. In the case of several major trucking companies, for example, personnel from local terminals may function in an advisory capacity to responders. However, since most of the products hauled in the area originate from local industrial plants, the personnel from these plants would generally direct response efforts. These shippers would inevitably be notified, if not done so directly by the driver, as part of the policy of the Chemical Transportation Emergency Center (CHEMTREC) in Washington. All of the transporters interviewed were aware of this organization. If matters went according to plan, CHEMTREC would be notified by the vehicle's driver and would provide feedback on the specific properties of the spilled material in order to aid the immediate responders until the arrival of the shipper's personnel. Therefore, the role of transporters in an emergency in this area is merely to initiate a response by informing the appropriate regulatory agencies and emergency response personnel of the problem.

The transportation companies that are members of the MAC periodically attend the monthly meetings. Although transportation personnel do not participate in the community disaster drills nor have their own, some of the larger companies do provide refresher courses to ensure that drivers are acquainted with their safety procedures.

Another communications network inspired by the MAC involves a warning and information system in which the local weather service office plays an integral role. In the event of an industrial incident, the affected plant can dial an unlisted number and provide the relevant information to a tape recorder. The message recorded on this tape would be played on the local National Weather Service Network and relayed automatically to all radio and TV stations hooked onto this network. The weather service office, similarly, uses this network to warn the community of impending natural disaster threats. The weather bureau and five Gabor radio stations are actively involved in the MAC disaster drills. The weather service also conducts approximately 14 of its own drills annually, most of which are oriented to natural disasters. Aside from its recognized warning function, the weather service office provides river flow and wind velocity information to industries experiencing a chemical spill.

There are fifteen hospitals in the area. All community agencies recognize the responsibility of these hospitals for providing medical treatment, and it is assumed that they stockpile necessary supplies and equipment. However, there is little evidence that there is any particular planning for mass emergencies which might be created by chemical agents. As is typical in many communities, the overall disaster planning of hospitals is relatively separate from and independent of other disaster planning in the community. There does exist a link between the local hospitals and the local Red Cross chapter. They conduct occasional drills, but these are independent of MAC or the city CDO initiated drills.

Of the two sectors involved in overall disaster planning, MAC and the city CDO, the latter is characterized by fragmentation and indifference on the part of many organizations. The former, on the other hand, exhibits considerable cohesiveness, at least on the part of its functioning members. There are few practical links between the two sectors insofar as overall community disaster planning is concerned.

On the whole, planning for chemical incidents predominates in terms of its comprehensiveness and on the basis of evaluations by the community. This is not surprising as the threat posed by chemical agents, as was pointed out earlier, supersedes all others. The high effectiveness rating given MAC by most of the respondents in the DRC study is based on their detailed operational planning, which includes the encouragement of in-plant emergency planning. This evaluation is also probably due to the MAC's record of being the first overall planning group in the area and the MAC's continuing development. MAC is also characterized by a specialized emphasis on the technical aspects of response to chemical emergencies and relative self-sufficiency in terms of expertise and equipment. Consequently, the organization requires little assistance from other local community or extracommunity sources.

However, this independence is detrimental or dysfunctional in those cases where active liaison with community agencies is needed, namely in the case of chemical incidents that extend beyond the boundaries of a plant. The MAC was particularly criticized by some of our respondents for their poor evaluation and medical support systems. Despite the MAC's sophisticated traffic plan, evacuation has been problematic in the past and probably will continue to be so in the future. This is due to the fact that the development of this part of the plan was motivated primarily by the need to prevent convergence on the disaster zone and to expedite a plant's acquisition of emergency supplies. Evacuation in the past has been hampered by a hesitancy on the part of affected plants to inform the media of an incident due to an overall industrial policy of maintaining a low public profile. Indeed, evacuation seems to present a general problem for any emergency in the area since fire departments, which are mandated by the county plan to be principally responsible for this task, do not always consider it to be their responsibility, an example being Gabor's fire department. The second major criticism leveled at the MAC concerns the lack of medical support systems involved in chemical emergency response. However, this problem can also be partly attributed to the lack of a county-wide medical communications system and the general inactivity of hospitals in overall disaster planning.

In the public sector, Gabor's CDO has been directing non-industrial disaster planning efforts in the city. Planning within the public sector has recently become somewhat more operational (e.g., with more disaster drills), and has increasingly incorporated more organizations (e.g., hospitals). Our respondents nevertheless thought that on the whole a general state of apathy and a lack of resources prevails. This apathy may be partly due to the MAC's dominance in planning and responding to industrial emergencies and possibly also, as indicated earlier, the state's involvement in local planning. The apathy among such organizations may also reflect a perceived widespread public indifference to natural and chemical hazards, which some of our respondents suggested was operative.

The major criticisms voiced about the CDO's planning initiatives pertain to its generality and overemphasis on delineating priorities and responsibilities, rather than allocating specific tasks to each organization. However, the CDO primarily sees itself as having overall coordinative responsibility and feels that each organization should devise its own detailed task-specific planning.

The lack of operational planning in Gabor's public sector has resulted in a general ignorance of the tasks of other emergency-relevant organizations and frequently, even of an organization's own responsibilities. In addition, the police, fire department, local hospitals and the Red Cross all seem unfamiliar with the county plan. The local CDO, for example, is often seen as undertaking numerous operational tasks in an emergency that does not have the responsibility nor capacity to perform. Also, while consensus exists regarding the performance of some traditional tasks (e.g., law enforcement, the provision of food, clothing and shelter to victims and establishing a pass system) confusion exists in the public sector with respect to the performance of such functions as the stockpiling of emergency equipment, search-and-rescue, evacuation, compiling lists of missing persons and the care of the dead.

General Observations and Implications

Certain factors in Gabor have been particularly influential in generating the current state of chemical disaster planning. Some of these factors have exercised a direct effect; whereas, the effect of others has been mediated by some other factor or set of factors. While some of these factors are tangible or objective (e.g., economic conditions), others are subjective and have influenced planning in more subtle ways.

The area's political and economic structure has been of primary importance in the chemical disaster planning undertaken. The powerful influence of the chemical industry in both the local and state political spheres has been conducive to the development of a major industrial disaster planning body such as MAC. The affluence of the local business sector has also facilitated their accumulation of abundant, specialized resources for both in-plant and larger mass emergencies. Conversely, the economic dependence of the community on local industry, has strengthened the probability that any enterprise undertaken by such businesses--including, of course, disaster planning--would be permitted to proceed with minimum intervention from the public sector. In fact, there were intimations in the DRC interviews, that in order to maintain itself without too many difficulties, the city's CDO had to proceed apolitically and exhibit only a low profile. Furthermore, the severe fiscal constraints placed upon numerous public emergency agencies, including both the county and city CDO, reinforced the domination of chemical disaster planning by the private industrial sector.

The characteristics of the local chemical industry have also contributed immensely to the current state of planning. The density of chemical plants in the area is a precondition of the establishment of the type of communications network existing among several of the industrial plants. Similarly, the clustering of some of the facilities has resulted in special communications network among contiguous plants. Also, the proximity of many area plants to populated areas has served as an impetus for the development of the emergency traffic diversion plan which is designed to accelerate the movement of resources to an emergency zone and to minimize the impact of chemical incidents upon local residents. Furthermore, the variety of resources possessed by the local chemical companies is a function of the diversity of manufacturing and related activities being performed by the area's plants.

The pre-eminence of chemical disaster planning in the region, as opposed to planning for other hazards, is also partly due to the perceptions of both the public and private sector respondents in the DRC study, that chemical incidents constitute the greatest threat to the community. These perceptions, in turn, have been closely related to the Gabor area's disaster experience. However, the influence of such perceptions is not unlimited since the public sector, which perceives the likelihood of chemical incidents to be higher than the private sector, has done considerably less in terms of planning for such events. Obviously, factors other than the perceptual are also relevant.

Although the public sector assigns a high rating to a chemical incident, it shows almost an equal concern for several other forms of threat. Therefore, the chemical threat, to public agencies, represents only one of numerous distinct types of hazards to the community. In addition to their lack of

resources to prepare for all types of agents, high levels of threat from several different sources may result in a desensitization to all threats and induce a state of apathy. In Gabor, apathy was said to prevail among personnel in public emergency-relevant agencies as well as the public at-large.

Private industry, on the other hand, perceives the threat of a chemical incident as far more likely than natural or other non-industrial disasters. This we have suggested is a function of their direct involvement in the industrial domain, as well as the influence exerted by the MAC itself. Consequently, emergencies involving dangerous chemical agents are salient in their thinking. Therefore, in addition to their superior resources and political clout relative to public agencies, the industrial community is more active in chemical disaster planning due to the greater saliency of chemical threats to industrial planners.

Improvements that have occurred in disaster planning, when generated by actual incidents, have not been due to increased awareness since a high level of such awareness was undoubtedly present before disaster impact, at least in recent times. Consequently, the development of disaster planning in such cases can probably be attributed to political pressure or business concerns in regard to public relations, and not to an increased level of awareness. A high level of awareness may have served as the original impetus for undertaking comprehensive planning; however, continued growth of industrial planning is attributable to specific conditions arising at particular points much later in time.

With respect to planning itself, the local industrial sector dominates the planning and response to chemical emergencies and disasters. In Gabor this results in an overemphasis on the technical aspects of disaster preparedness. Technical matters are important for effective response but can lead to downplaying or ignoring equally essential non-technical aspects. As already noted, Gabor, for example, has potential problems in those activities requiring active community liaison, such as evacuation and the delivery of medical services during chemical incidents. There are some planning and physical resources for mass evacuation, but no good warning system exists for early warning or any warning at all to the general community. The absence of a warning system could pose major problems in any evacuation effort. Lack of attention to this non-technical matter is partly attributable to industry's desire to play down threatening events in which the chemical companies may be involved.

Industrial self-sufficiency and the focus of the chemical companies on technical aspects of planning which are of little relevance to community planners may be another source of community apathy, resulting in public sector personnel being excluded from active involvement in the most salient and prestigious organization concerned with emergency planning in the area. This apathy may, as witnessed in Gabor, extend to an abandonment or strong downplaying of concern and interest in disaster planning among excluded parties.

In the event that the personnel of such organizations are required in a mass emergency, their potential contributions would necessarily be limited. Therefore, an overreliance on one group in the community and an overemphasis on highly specific task areas are probably detrimental to the response to a mass emergency which would require the concerted efforts of diverse public and private groups. Interestingly enough, both the county plan and the MAC charter provide for active contact between the private and public sectors in Gabor. But, in fact, this is not what prevails in actuality for reasons that have been indicated.

CHAPTER IV

DISASTER PREPAREDNESS IN THE METROPOLITAN AREA OF JOHNSON

In this chapter, the metropolitan area of Johnson is described and analyzed. That area encompasses around a million and a half people and dozens of governmental and political subentities including the city of Johnson and its neighbor 22 miles away, the city of Lewis. Both cities are, according to the U. S. Bureau of the Census, part of the same Standard Metropolitan Statistical Area (SMSA). The Johnson SMSA is typical of many in the United States which in absolute numbers have many scattered chemical plants and transporters, or even complexes of such activity, but in which the chemical industry as a whole is a relatively small part of the total manufacturing complex and business activity of the area. For purposes of exposition, the total metropolitan area of Johnson will be designated JMA; when reference is to the individual cities, they will be talked about as either Johnson or Lewis.

Community Characteristics

Both Johnson and Lewis have several major bodies of water around them, and the same large river, the Lewis, runs through the two communities. Smaller rivers and estuaries also cross the JMA, although none, other than a small portion of the Lewis, are navigable for anything but very small boats.

The entire area of the JMA covers around 1,600 square miles, with Johnson County occupying approximately two-thirds of the total area. The terrain of the area is generally flat-to-rolling, which develops into a hilly region in the southern part of Johnson County. Underneath the pleasant surface of the JMA are layers of rock which were formed out of sediment collected beneath large bodies of water covering much of the land in prehistoric times. The subterranean deposits of shale and clay common to the JMA make it an ideal site for hazardous materials waste storage facilities.

Residents of JMA experience both ends of the weather spectrum. On the average, in the summer the thermometer comes within a few degrees of the 70 degree mark, and in the winter the mid-twenties is average. Precipitation is abundant. The average annual rainfall is approximately 25 inches. The changing climate, along with the surrounding lakes and river, makes a wide variety of outdoor recreation such as boating, fishing, swimming, skiing, tobogganing and snowmobiling possible.

There is a very dense concentration of industry in the JMA and for several good reasons. First, the JMA lies at the heart of North America's greatest concentration of industrial and commercial activities. Ten of the eleven largest U. S. industrial centers fall within a 500 mile radius of the metropolitan area. Second, Johnson is a major port, ranking in size in the top several dozen of all the main seaports in the United States. Facilities, which allow ocean-going vessels to dock and provide a half-million

square feet of storage space, make Johnson a major center of commerce. Finally, Lewis has very large hydroelectric developments, providing the energy and water resources needed for industrial activities. Although the chemical industry makes up a relatively small fraction of the total manufacturing complex, almost 20% of the state's chemical employment is concentrated in the JMA, primarily in Lewis.

Of the approximately one-and-a-half million people who live in the JMA, roughly one-sixth live in Lewis County and the remaining five-sixths in Johnson County. Of those who live in Lewis County, approximately 85,000 make the city of Lewis their home. In Johnson County, nearly half of the more than one million residents are located in the city. Both cities have undergone a loss in population in recent years. A 13% dip in Johnson and a 6% decrease in Lewis' population occurred during this time period. The two cities differ in population density. In Lewis, there are approximately 6,500 people per square mile. In Johnson, on the other hand, almost twice as many residents are found per square mile. The two counties, as would be expected, are considerably less densely inhabited than the cities. A count shows around 1,000 persons per square mile in Johnson County and somewhat less than half that in Lewis County.

Near the turn of the century thousands of Southern and Eastern European immigrants flocked to Johnson and Lewis seeking employment in the factories, a fact of history reflected today in the highly ethnic concentration of the cities. Although the cities have primarily white populations, approximately one-fifth of the Johnson residents are non-white, as compared to 10% of those living in Lewis. In both counties the non-white population is concentrated in the central city.

Other demographic characteristics are typical of metropolitan areas in the United States which have suffered a population decline. Nearly 15% of the residents in Johnson and 12% of those in Lewis are 65 years old or over. The medium level of schooling in both counties is about a dozen years, with no more than 10% of the population in any locality having graduated from college. Home ownership in the area varies from around a low of 45% in Johnson to a high of around 70% in Lewis County.

Different parts of the JMA are traditionally Democratic and Republican. In general, the most ethnic areas tend to be Democratic, with the rest of both Johnson and Lewis Counties being heavily Republican in congressional and presidential voting. The city administrations themselves are usually Democratic; the county is usually Republican.

The city was incorporated in the early nineteenth century. A mayor/city council form of government is currently used and includes 15 council members, nine elected by wards and the remainder elected at-large. Terms run four years with a two-year overlap.

The economy of the JMA is varied. According to value added by manufacturers, the area is among the nation's top 20 metropolitan areas in rubber and plastic products; fabricated metal products; transportation equipment; paper and allied products; stone, clay and glass products; and ranks

high also in electrical machinery, printing and publishing, and in food and related products. Manufacturing in the area which produces over three billion dollars worth of goods provides jobs for nearly 150,000 workers.

While manufacturing is the prime industry, there are other important activities in the area. These include wholesale and retail trade, government work, transportation, services, insurance, real estate and construction. The JMA tends to have somewhat higher unemployment rates than the national average.

Industry is drawn to the area by several other factors. The Johnson metropolitan area is a major intersecting point for the highway system. Dissecting or terminating in the area are five federal and 26 state highways and one interstate. The trucking services necessary to take advantage of the highway network are readily available. In addition to nearly 150 common carriers, five transcontinental and 11 international carriers are open for business. In addition, seven railroad companies and around 35,000 trains a year, representing one-third of the total rail mileage in the United States, serve the JMA. Finally, two major airports in the area, served by five trunk airlines, carry over 70 million pounds of air mail, air freight, and air express annually.

As noted earlier, the JMA ranks among the nation's top 20 metropolitan areas in the manufacture of chemicals and allied products. Although the chemical industry is well represented in both cities, it is more important in Lewis. In Lewis, workers in the chemical industry make up about 20% of all those employed in manufacturing as compared to only about 8% in Johnson. Services to support the chemical industry (e.g., transportation, storage, etc.) also contribute significantly to employment in the area.

The range of chemicals produced, stored and transported throughout the JMA is impressive. Acids, alkalines, aluminum chloride, chlorine, dyes, carbide, paints and varnishes, and plastic products lead the broadest categories. Large quantities of chemical substances are used by metal producers and fabricators, also key industries in the area.

Storage and transportation of chemicals throughout the county area are of considerable scope. Two large railroad yards serve as local and regional switching areas for the seven rail companies mentioned earlier. One Conrail source reported that Johnson has the second largest volume of hazardous materials shipped by train in the U. S.

The major chemical and petrochemical companies are scattered around the port area of Johnson and the Lewis River north of the city limits and into the city of Lewis itself. Their proximity to populated areas is marginal; e.g., the plants are old and residential areas have built up around them, but the major chemical industrial areas are still in an "industrial park" setting and conform to a 2500-foot planned safety distance from populated areas. This minimum distance, which generally applies to flying objects from an explosion, does not take into account the release of toxic gases, however, and the residential areas surrounding the plants would be highly susceptible to becoming affected by a toxic cloud.

Community Disaster Vulnerability

The high level of industrialization makes the JMA a prime target for chemical incidents. A few years ago, the explosion of a railroad tank car filled with chlorine killed four chemical plant employees and left nearly 100 others with injuries serious enough to be treated at local hospitals. Other chemical incidents which have occurred in the area include ammonia leaks, chemical fires, and road spills of oil and similar material.

In addition to the high susceptibility of chemical disaster, the general area in which the JMA is located is in a part of the country which has historically been the site of severe winter storms and flooding. In 1976 a devastating ice storm struck and the following year the "Blizzard of '77" paralyzed the area with drifts of 18 to 20 feet. Tornadoes have struck the southern part of the JMA, and there have been some floods in the area.

To some extent the area's disaster history is reflected in the disaster probability ratings DRC obtained in its study. Officials from public and private organizations made judgments as to the probabilities of certain kinds of disasters occurring in the JMA, Johnson and Lewis. Refer to Table IV-1.

Examination of disasters thought most likely to occur in the next 10 years reveals a definite pattern. In the JMA as a whole, the results of the public and private sector combined show that the major threats, as perceived by the respondents, are either weather-related or some type of industrial incident. Seven of the top 10 disasters fall into one of these two categories. Major frost and freeze and a blizzard or massive snowstorm received top ranking. Following in descending order are chemical contamination or spill, freezing ice storm, major industrial explosion--chemical plant, major industrial explosion--other, and in seventh place, a sudden toxic substance release.

Comparison of the public and private groups reveal a high correlation in the order of the rankings. However, in comparing the public sector to the private, the results do show that the public sector rated the probability of each disaster higher in the 5-point scale than did the private respondents. On the average, the probability ratings given to the first seven disasters (all weather or industry-related) by the private sector was greater than those from the private group by a magnitude of 1.06. The disparities between the final three disasters (water main break, automobile wreck, and flash flood) were even greater, with the rankings of the private sector being an average of 1.79 lower. On the whole, it appears that both groups are in basic agreement as to the major disaster threats, although the public sector consistently reports a higher degree of probability.

Perceptions of probable disasters differ somewhat between the two cities. Chemical disaster seems to be more of a threat in Lewis as evidenced by the top ranking of chemspill and the ranking of explosion-chem in third place. In Johnson, on the other hand, weather took top billing, with blizzard, frost and ice storm, respectively, taking first, second and third place, although chemical disasters were also assigned high probabilities. The relatively high ranking of chemically-related incidents does not reflect

TABLE IV-1

JMA Disaster Probability Rating

Public and Private Compared

	<u>Top 10 Combined</u>	<u>Public</u>	<u>Private</u>	<u>Difference</u>
1. Major frost and freeze	4.35	4.53	3.33	(1.2)
2. Blizzard or massive snowstorm	4.33	4.56	3.00	(1.56)
3. Chemical contamination or spill	4.00	4.11	3.00	(1.11)
4. Freezing ice storm	4.00	4.11	3.33	(0.78)
5. Major industrial explosion--chemical plant	3.95	4.06	3.00	(1.06)
6. Major industrial explosion--other	3.50	3.67	3.00	(0.67)
7. Sudden toxic substance release	3.45	3.56	2.50	(1.06)
8. Major water main break	3.2	3.33	2.00	(1.33)
9. Large automobile wreck or pile-up	3.15	3.33	1.50	(1.83)
10. Flash flood	3.06	3.20	1.00	(2.2)

Public and Private Combined

	<u>Johnson</u>		<u>Lewis</u>
1. Blizzard	4.38	1. Chemspil	4.4
2. Frost	4.27	2. Ice storm	4.4
3. Ice storm	3.88	3. Explosion-chem	4.4
4. Chemspil	3.86	4. Blizzard	4.2
5. Explosion-chem	3.75	5. Explosion-other	4.0
6. Explosion-other	3.47	6. Frost	3.83
7. Toxic release	3.40	7. Toxic release	3.6
8. Flash flood	3.31	8. Water main break	3.4
9. Car wreck	3.2	9. Blackout	3.2
10. Water main break	3.13	10. Pollution	3.2

a correlation between actual experience and perceived threat as it does in the blizzard and freezing ice storm categories. Lewis has had relatively few recent chemical transportation or fixed location incidents which impacted a sizable portion of the community. Storage tank fires, a few truck incidents and a railroad car fire were the most recent chemical incidents reported by emergency personnel.

Whatever was involved, there has been an increase in perceptions of threats to the community in recent times. This can be seen in the scores of Johnson officials obtained in a 1972 DRC study when compared with those acquired in 1978. For almost all categories, and particularly for hazardous materials, the more recent scores are considerably higher than the earlier ratings.

Table IV-2

	\bar{X} Score	
	<u>1972</u>	<u>1978</u>
1. Blizzard or massive snowstorm	4.00	4.33
2. Freezing ice storm	3.95	4.00
3. Major frost and freeze	3.84	4.35
4. Major industrial explosion	3.28	3.95
5. Flash flood	3.11	3.06
6. Massive automobile wreck	3.10	3.15
7. Water pollution	2.95	3.00
8. Plane crash	2.89	2.90
9. Chemical contamination or spill	2.85	4.00
10. Electric power blackout	2.74	3.00

The high degree of threat exhibited by emergency planners was ascribed by local officials to be the result of several factors, the most noteworthy ones being:

- 1) national media attention of the Waverly, Tennessee and Youngstown, Florida train derailments (which had occurred just at the initiation of the DRC field study);
- 2) the concern and initiative of the Johnson Fire Department's training officer with respect to chemical emergencies in the area, and his perception of a lack of proper training and coordination to meet such threats; and
- 3) a growing national awareness over the potential harm done by hazardous materials when exposed to the environment. This awareness was reportedly fostered by professional organizations such as the National Fire Protection Agency and the U. S. Department of Transportation.

Resources

Local Resources

The resource situation in both Johnson and Lewis as well as the JMA cannot be understood unless two background factors are recognized. Neither city has done much disaster planning although Lewis, the smaller locality, is

somewhat better prepared than Johnson, the bigger city. Furthermore, although they are contiguous to one another, there is practically no contact of any kind between public and private emergency groups in one locality and their counterpart agencies in the other community.

The somewhat better state of preparedness in Lewis is indicated by the fact that the local civil defense office does have a roster of disaster resources. A roster including names, addresses, and telephone numbers of local government and private service key personnel was compiled in 1973 and distributed to all those who might be involved in a disaster response. No such personnel or agency roster exists in Johnson.

In Johnson the local civil defense office had provided for a central command post in the same building which serves as the police and fire department headquarters. In Johnson there is an underground bunker designed to serve as a center for emergency governmental operations. Built at a cost of nearly \$600,000, it was once thought that this bunker would serve as a center of operations for leaders of all utilities, major political officials and heads of governmental services if there were emergency or disaster conditions. However, the bunker with limited phone and radio contact or internal communications, stands virtually empty, and a number of key officials do not seem even aware of its existence. It has never been used for any kind of emergency. There is also a strong feeling among leaders of response agencies that a decentralized system of response has worked well in the past, and there is no need for an artificial imposition of centralization, which the use of the bunker might create. The poor planning for the bunker was further illustrated during an ice storm when the fuel tanks for the internal generator were discovered to be filled with thousands of gallons of water, rendering the facility useless. Currently, in the event of a large-scale disaster, the central command post will be located in the fire commissioner's office.

To the extent there is any emergency organization in Johnson, it is in the fire department. While city appropriations have been cut during the past several years resulting in layoffs and loss of equipment, the department continues to maintain a degree of visibility and to take some initiative in disaster planning. At present the department consists of a little more than 1,000 employees, which is a figure of about one fire fighter per 390 residents. Several companies of volunteers supplement the paid force, but bad relations exist because there is conflict concerning the insurance protection of volunteer companies called for stand-by duty.

In 1975, the city of Lewis employed around 200 fire personnel, amounting to one firefighter per 400 residents. Approximately \$50 per capita was spent on the operation of the fire department. The salaried force is augmented by 29 smaller volunteer fire departments located in the surrounding areas. The Lewis fire department is the chief planner and coordinator of hazardous materials responses in the area, and the department had compiled a disaster resource inventory.

In 1975, Johnson employed approximately one police officer per 300 residents, and police department expenditures were \$60 per capita. The

Johnson County Sheriff's Department has full criminal jurisdiction as well as responsibility for staffing the county jail, but does not maintain a close relationship with city emergency organizations. Neither the city police nor the sheriff's office has done much disaster planning.

In Lewis, 195 police personnel were employed in 1975, translating to a police-to-resident ratio of 1 to 415. Per capita expenditures, at \$55, were very close to that of the fire department.

Analysis of the emergency communication systems in operation reveal no centralization or coordination between Johnson and Lewis. In Johnson, the emergency service organizations are dispatched through a 911 communication system operated by the police department. The Emergency Medical Services (EMS) are linked primarily through a separate MERS (Medical Emergency Radio System) which is virtually the only highly integrated network existing in Johnson County. The 20 hospitals in the city and EMS transporters are linked and coordinated by MERS for all disaster response operations although ambulances may also be dispatched through the 911 emergency numbers. The MERS network functions independently of all other community agencies.

In Lewis, emergency communication is handled both by telephone and radio. The communication system of the fire department dispatches ambulances for the city although city EMS and county EMS have separate ambulance dispatching centers. Communications by the fire control unit or the fire communication unit with other EMS components is generally by telephone. Until very recently, there was no direct hospital-to-hospital or ambulance-to-hospital radio communication. Instead these contacts were made through the police department. The Lewis area has more recently developed Radio Amateur Civil Emergency Service (RACES) which is an organization of amateur radio operators who provide radio communications requested by government services during disaster and emergency situations. The function of the radio network is to connect the city's Emergency Operating Center with fixed and mobile stations throughout the city of Lewis, including the Red Cross, the seven hospitals, and radio stations. RACES is supplemented by Civil Defense Citizens' Band Radio Services, made up of volunteer citizen CB radio operators.

The Johnson Red Cross attempts to play an active role in disaster planning. However, the organization does not have a large staff and the facilities for providing emergency sheltering are rather limited. Its information as to location and access of prestocked supplies is outdated and unorganized. The National Red Cross Disaster Training and Response Guides are presented as their overall plan for an emergency. The local chapter has compiled a Disaster Services Guidelines and Procedures Manual. The Purpose of this manual is to assist trained volunteers in the post-disaster response. The Red Cross Chapter in Lewis also assumes its assigned responsibility for providing relief to persons and families in need as a result of natural disaster. In both Johnson and Lewis, the Red Cross chapters have, independently of each other, become involved in planning and staging drills and simulated chemical hazards accidents.

The chemical and petro-chemical industries in the metropolitan area maintain a variety of specialized equipment and personnel trained in chemical

emergencies, but do not presently have any type of mutual aid system or any other systematic interorganizational means of sharing resources. In Johnson, some of the plants maintain a liaison with the fire department to facilitate a coordinated incident-management effort; however, these liaisons are more informal than structured and the exception rather than the rule. Also while the fire department does have some acid suits, Scott air packs and foam, the bulk of equipment designed specifically to deal with hazardous chemicals primarily owned by private industry.

The Johnson civil defense office presently consists of an acting director and a secretary. A full-time director was hired in 1978 but resigned recently due to a possible conflict of interests. While a new full-time director is being sought, it does not appear imminent that one will be found. There is a Basic Civil Defense Plan for the county, mostly oriented to nuclear warfare problems.

The Lewis civil defense office on the other hand, plays a role in natural disaster planning. In 1973 the Lewis civil defense office developed a basic plan for coordination of disaster assistance in the community. This was followed in 1977 by an addendum outlining the industrial emergency plan, and in 1978 a radiation annex was added. But while such planning has gone on, other emergency organizations in Lewis do not consider the local civil defense agency as having much importance.

Extra-community Resources

The area's relationship with the state civil defense agency is not an optimal one. In a report to the Temporary Citizen's Advisory Committee, the local representative of this state office pointed out that Johnson is not meeting state and federal mandates and that this office would have to take over in the event of a major casualty disaster. In terms of other state aid, the state police is crime and traffic-control oriented and usually does not step out of these areas in a disaster situation. It lacks sufficient personnel and equipment which would be necessary to provide any substantial assistance to other civil authorities.

All three military service groups maintain National Guard units within the area and the Army has a chemical laboratory listed among its area offices. This facility, however, was not mentioned by any informants as a possible resource in a chemical incident. In spite of the large numbers of military personnel and supplies positioned in the area, any attempt to provide disaster aid to civil government would be complicated. Any request by a municipality must be channeled through the state civil defense agency to the State Division of Military and Naval Affairs, a requirement that virtually eliminates the possibility of an immediate response in a disaster situation. Furthermore, the stipulation that the requesting municipality must bear 50% of the expense is enough to make local officials think twice about requesting help. The U. S. Army Corps of Engineers, which would only be involved in disaster response after a presidential declaration of disaster, is in somewhat the same category. Although the corps has limited resources in the area, it did provide damage survey teams following the March 1976 ice storm.

The U.S. Air Force Reserve, which has located a Tactical Airlift Group at Lewis Air Base, is in a better position to aid in disasters. The controlling regulations give the local commander greater latitude in responding to requests from civilian officials, and the unit did respond during the 1976 ice storm.

The Coast Guard, which has limited manpower and equipment for shore-based operations, is nevertheless an available source of disaster assistance. The local commander is given a free hand in responding to requests from civilian authorities. The district office has used this authority to conduct plant inspections and hazardous materials inventories, demonstrating an awareness of hazardous material threats on the part of the port commander and safety officer. The Coast Guard's assistance is especially valuable because it possesses an extensive FM radio network throughout the region, and it did, in fact, put this resource to use during the 1976 ice storm. In addition, many of their marine units are equipped to deal with oil spills and fires and have access to the Chemical Hazards Response Information System (CHRIS).

Aircraft, some watercraft, heavy equipment, transport vehicles and communication equipment are all available through the various guard units. A previous local civil defense director was a high-ranking member of a National Guard unit and maintained close formal (planned) and informal linkages with the military. However, his retirement and the general decline of the civil defense role in nuclear disaster planning seem to have created, with the exception of the Coast Guard's contribution, a decline in the military's role from a salient entity in community planning to that of a backup resource when a major incident occurs.

History of Disaster Planning

Historically, there has been very little community-wide disaster planning in Johnson. Lewis with a higher proportion of chemical producing or handling facilities, has made more provisions for disaster preparedness; yet there is a quite apparent lack of coordination among these resources. Furthermore, as already indicated, there is no formal coordination of disaster or emergency planning between the Johnson and Lewis areas. Jurisdictional boundaries between the areas have been and currently are strictly adhered to by agencies and planners. The almost total lack of coordination among the emergency leadership may be attributed to two major factors: (a) the JMA is beleaguered by the financial problems of a rapidly declining tax base, population, and industrial core. Therefore, disaster planning has been viewed as a "frill" and accorded very low priority, when it comes to budget allocations; and (b) key positions are held by politically appointed decision makers who have had little historical experience in sharing resources and interorganizational task delegation.

The history of disaster planning in Johnson can be best understood by examining the agency generally designated the coordinating office for disaster response--the Office of Civil Defense. Expenditures ranged from \$325,000 (including federal funds) in operating expenses in 1955 to a high of nearly \$775,000 in 1972 to zero in 1976. Funds were used to develop contingency

planning and maintain interorganizational operationalization capabilities to control civil disobedience. This expanded function of civil defense, while heavily promoted and funded, essentially remained in the hands of the police and fire departments of Johnson; the primary community-wide contingency plans maintained by the county civil defense remain nuclear war-oriented to this date.

The Johnson civil defense office although fully staffed until the late 1960s, gradually deteriorated to a one-person operation in April of 1978. During this time period, the civil defense unit lost its accreditation by the State Civil Defense because of its failure to fund the warning system. This state of affairs necessitated the takeover of civil preparedness by the Regional Civil Defense until 1978, and the transference of the daily functions of the office to the local fire department. According to the Temporary Citizens' Advisory Committee on Disaster Preparedness, organized in 1977 to study the status of disaster preparedness, civil defense failed because it lacked a continuing vital mission, because its leaders connected its existence too closely to the threat of nuclear attack, and because it failed to effectively coordinate the leaders of the municipality's utilities and service organizations.

Until recently, disaster planning in the Lewis area has been conceptualized as nuclear defense. Local political support is sporadic and changes with every new city manager. Although Lewis civil defense has not suffered neglect to the same extent as has civil defense in Johnson, it is nevertheless clear that disaster preparedness is not a priority issue.

Certain disasters and incidents which have occurred in the metropolitan area have influenced the approach taken towards disaster planning. Not until after the 1975 chlorine gas explosion, which occurred in a chemical plant in Lewis, was the industrial emergency plan added to the city's basic plan for coordination of natural disaster assistance. But this industrial plan was written by the civil defense office without the input of either the police or fire chiefs, a clear indication of the lack of coordination among response agencies. This major chemical incident, which killed plant employees, did not, however, generate the development of a similar industrial emergency plan in nearby Johnson.

This local incident, but to a greater extent the extensive media attention focusing on several "spectacular" chemical incidents across the nation, have served to initiate an effort on the part of the Johnson fire department to develop contingency plans to deal with hazardous materials incidents within their jurisdiction. Grid maps are being put together to facilitate typical law enforcement functions such as control of points of access and exit from impact areas, emergency routes, staging areas, and crowd control. These grid maps have been developed by the Johnson fire department to better facilitate coordination between the police and fire departments and will eventually be broken down into coded sector pages which all division chiefs will carry.

The recently developed concern over hazardous materials emergencies has also manifested itself in the planning and carrying out of several simulated

chemical hazard incidents. The impetus to concentrate on hazardous materials preparedness has been directly the result of concern expressed publicly by the Johnson fire department, and more specifically, the director of its training bureau. The fire department has historically been involved in community-wide disaster planning but has clearly taken the protagonist's role in hazardous materials and incident management.

Realizing the potential for a specific catastrophic event and mobilizing community support for handling such an incident developed into two quite different problems for the fire department, however. Recognizing the dramatic increase in hazardous materials incidents (or the marked perception of an increase) and the large volume of hazardous materials being shipped through the Johnson area, an effort was made to commit fire department resources to training and equipment programs to mitigate the threats. However, fire department resources were not allocated for these purposes, and other public and private organizational support failed also.

In almost every organization approached by the fire department, budgetary constraints were cited as the limiting factor to any commitment of resources. The award winning film, "BLEVE" (documenting several large chemical explosions) was shown to the Johnson city council in an attempt to generate policy and funds for chemical emergency equipment. While reason for concern was noted and expressed by city council members, no expenditure was approved for the provision of equipment or training. Undaunted, the Johnson fire department training director developed a program designed to familiarize local police and fire personnel with the potential danger of hazardous materials cargo and to provide operating procedures for their coordinated response to hazardous materials emergencies. Many of the training aids were hand-made, but the effort expended and number of emergency personnel trained have been substantial.

Another major incident which has prompted re-evaluation of disaster planning in the area was the severe ice storm which struck the area in the late 1970s. The response of the various service organizations during the initial hours of the recovery effort made it quite apparent to the county's political leaders that there were some serious gaps in the area's disaster preparedness. An article in the local newspaper following the storm quoted a Johnson councilman as saying, "we got caught with our pants down during the blizzard and I don't want that to happen again". The outcome of this concern was the formation of a temporary advisory committee on disaster preparedness made up of interested citizens who were not service deliverers but represented a broad cross-section of the community.

The purpose of the committee was not to design a disaster plan but to assess the present and potential capabilities of existing agencies and pinpoint areas where improvement could be obtained. The basic finding of the committee concerning the response to the ice storm was that the community, despite the lack of central coordination, responded well. However, the committee also stated that the area lacks an "effective central disaster coordinating body".

It was noted that several central agencies responded to the developing ice storm within their respective areas of responsibility, but failed to activate or communicate with the county executive office and other county officials. The most striking example of this lack of communication between primary response agencies was noted in the committee's report. Although the county sheriff's department had patrols on the road with 24 hour dispatch coverage during the storm, it did not alert other agencies. This is the same department which answers the civil defense phone during non-business hours.

The committee did find, in addition to the failure on the part of the sheriff's department, other problems in the community's disaster response. Even so, they hastened to point out that a consolidation of districts and agencies, such as that attempted in the bunker episode described earlier, would not necessarily lead to an improvement in disaster response. It was the conclusion of the committee that effort should be focused on continued independent, albeit coordinated, responses by separate agencies rather than a centralization of essential services.

The next year, following the record snowfalls of the blizzard, the citizen's advisory committee issued a supplement to the initial report. The main focus of the report was to urge prompt development of organized disaster response plans. The immediate and independent response of the local police, fire companies, and local county highway department was perceived to have been successful in minimizing losses. There was, however, a complete lack of any detailed aid until four days after the declaration of local states of emergency. The committee concluded that this would not have occurred if "the county had in existence an effective disaster response plan coordinated by full-time, knowledgeable and capable individuals. Through such a coordination, aid could flow on a prompt, moderated basis which would meet local needs at a minimum of cost."

In the private sector, emergency planning on the part of the industries has historically been on an independent basis. One exception to the pattern was the organization of the Lewis Industrial Emergency Council in 1958. The purpose of this body was to provide a plan tailored to meet industrial emergencies by a system of mutual aid. Lack of interest in this organization led to its eventual decline; very few local officials seem aware of this organization, indicating that although it may still exist on paper, it is not a viable resource for emergency response. The general pattern in both Lewis and Johnson is for each plant to take care of its own problems, calling for outside help at their own discretion.

To summarize, with the exception of the efforts by the Johnson fire department, disaster planning has been all but non-existent in the Johnson area to date, and there are indications that it will remain a very low community priority. In Lewis, although the preparation is far from optimal, the local civil defense has been active in the development of basic disaster plans. But there is the complete lack of any contact between the two communities. No organization in Johnson or Lewis could recall any effort to coordinate disaster tasks between the two areas although some flood and severe winter weather incidents have impacted both areas.

Current Status of Disaster Planning

Currently, only the Johnson fire department has even an orientation towards overall planning. But it operates with no overall contingency plans, relying instead on its standard operating procedures. The resources available for disaster and emergency response are almost nil, and the expertise of the personnel does not extend much beyond fires and hazardous materials incidents. The fire department does recognize the potential threat of hazardous materials incidents in the area and has started training sessions and plant inspections for risk assessment purposes. The fire department maintains sporadic contact with the sheriff's department, the Coast Guard, the city police, Conrail, volunteer fire departments and the state police but does not have strong interagency ties with any of the other response organizations.

In Lewis, the city fire department is the chief planner and coordinator of hazardous materials response--smaller, volunteer fire departments are integrated into the county response plans. The fire department has not written a disaster plan but operates according to its standard operating procedures. These indicate that the department's duties are to contain and extinguish fires, obtain aid under the county Fire Mutual Aid Plan, utilize fire emergency rescue and first aid squads, and remove trapped and injured persons from damaged structures. The Industrial Emergency Plan states that the fire chief or designated representative in concert with the local civil defense office will assume responsibility for the direction of all local government and private agencies. The Lewis fire department maintains varying degrees of contact with the police department, civil defense, Red Cross, mayor, city manager, hospitals, sheriff, and emergency medical services.

Second to the fire department, the Johnson police department possesses the greatest amount of disaster planning and response capability. Like the firefighters, the police also lack any overall contingency plans. Their activities are focused almost exclusively on traditional police tasks such as traffic control, civil unrest, etc. The department does not conduct drills or actively coordinate with any other response agencies on a routine basis. In fact, very low priority is placed on hazardous materials training because it is said, very little widespread damage has occurred in recent years.

In Lewis, the police department is located in the same building as the fire department headquarters and has an adjoining communications center. There appears to be a close, but largely informal relationship between the two organizations. According to the city's industrial emergency plan, the police department's responsibilities during an industrial incident, in addition to its traditional duties, are to place a liaison officer at the gate of the affected plant, establish traffic control and roadblocks, and direct evacuation.

The decline of civil defense in Johnson was noted earlier. Subsequent to the temporary advisory committee's report in 1978, money was appropriated for hiring a full-time civil defense director and the development of a county-wide disaster plan, to include hazardous materials incidents. Johnson did, in fact, hire a full-time coordinator and submit a program proposal to the state office of disaster preparedness. However, it appears the position was established merely as a political gesture to silence adverse public opinion.

The organizational boundary protection which exists in the Johnson area virtually insures failure of a revival of the civil defense office. A further indicator of the status of civil defense in Johnson was the response of the state police to a letter from the civil defense office requesting communications and response liaisons. In its reply, the state police noted that civil defense in Johnson has historically been a non-functional entity, and, therefore, it did not want to expend the time and equipment necessary for a county-wide preparedness plan.

The civil defense office in Lewis has fared somewhat better than its neighbor in Johnson. Recently, the city civil defense offices from Lewis and two surrounding towns were consolidated into an overall county office, putting civil defense on the county level. In addition to the basic plan, they have written supplements covering industrial and radiation emergencies as well as an appendix regarding citizens' band radio service. It is left up to individual departments and agencies to write their own disaster plans, a goal which, although pushed by the civil defense office, has not been accomplished.

According to the basic plan, the civil defense role, under the direction of the city manager, is to integrate and coordinate aid provided by government and private agencies. According to the Lewis civil defense office, the agency has little power over either the fire or police, and virtually none over private industry. Civil defense is officially in charge of the auxiliary police force, although the sheriff would in actual fact coordinate this group. Likewise, the county volunteer fire department is under the direction of the civil defense office, but cooperative relations between the local civil defense offices and the professional city fire department do not exist. Overall, it appears that civil defense in Lewis has been delegated a considerable amount of responsibility without the necessary authority to implement the effective disaster planning.

The linkages which exist among the Johnson agencies are best characterized as informal and mainly dependent upon the initiative of officials from all the organizations rather than upon written agreements detailing specific tasks or responsibilities. As there are no written procedures for coordinating a disaster response in the Johnson area, there can be little or no knowledge of preferred activities by emergency organizations except for their own traditional task sets. Periodic disaster meetings, drills, or other functional contacts are practically non-existent on a community basis.

In Lewis, because of the centralized location of the fire and police department offices, there is more communication between the two groups although contact with other response agencies is more sporadic than routine. The Lewis Red Cross does periodically plan and coordinate drills with the fire department.

In spite of the high concentration of industries in the JMA, there is no industrial mutual aid program. In the event of an industrial disaster or emergency, it is the policy of the fire and police departments to respond only when so requested by plant officials. One superintendent of safety at a major chemical plant in Lewis maintains a very close relationship with the fire department and has a direct line to fire communications, but that is a very

atypical relationship. In spite of the fact that an explosion or other incident in one plant could easily affect a neighboring facility, there does not appear to be any formal coordination of response between plants.

General Observations and Implications

Presently, the responsibility for hazardous materials planning, response, and recovery throughout the Johnson area rests almost exclusively with one agency, the fire department, and only partial support is exhibited by other organizations. Likewise, in Lewis, the fire department is the primary coordinator for disaster response. In addition, there is no industrial mutual aid system.

The disaster vulnerability assessment which was given to Johnson and Lewis respondents indicates that both public and private respondents have a relatively high perception of the possibility of a chemical incident. However, actual support for disaster planning is very minimal, increasing only temporarily during disaster or emergency situations. Several recent incidents vividly illustrate that there continues to be a glaring need for a coordination of disaster planning and response. In 1979 a railroad car loaded with chlorine derailed just within the boundaries of the city of Johnson. Approximately 20 hours later, at which point no word had been received from the railroad, the U. S. Coast Guard telephoned the Johnson fire department to inform them of the incident. When the acting disaster coordinator was notified, he did arrive at the scene but made no attempt to follow procedures. The railroad then proceeded to right the car without notifying the fire department that this operation was going to take place. The railroad eventually decided to repair the car while loaded, and this was undertaken successfully without incident. A similar situation occurred a few months later just over the Johnson County line. Two cars of vinyl chloride derailed and went off a bridge into a creek bed. Fire personnel were notified by the police hours after the incident, the latter being attracted by chance to the glaring lights of the repair crew.

While it may be that the area has not yet sustained a hazardous materials incident of substantial proportion, it appears that the capability to respond, particularly to a transportation accident, is marginal. Although the importance of hazardous materials preparedness has been recognized by several community leaders such as the fire department safety trainer in Johnson and the civil defense director in Lewis, their efforts have not generated the level of support necessary to make any substantial impact on the status of disaster planning in the metropolitan area. Furthermore, there is virtually no indication that the two counties or cities view this as a mutual problem, and they have not coordinated any resources.

Of course, the lack of planning for chemical disasters is reinforced by the even worse state of preparedness for disasters generally in the JMA. It is almost certain that poorer disaster planning probably does not exist in any other metropolitan area in the country. Both in terms of quality and quantity, and whether judged relatively or absolutely, the JMA must rank among the poorest in the United States with respect to disaster preparedness.

Clearly a number of different factors are responsible for the existing state of affairs. There is a negative social climate with respect to preparing for disasters. Interorganizational conflicts and differences, rooted in a long community history, work against consensus and cooperation. The general decline of the metropolitan area's economy makes for strong competition for evershrinking resources. The relative rarity of actual disasters, despite relatively high probabilities of mass emergencies, has not provided local emergency organizations many opportunities to seize upon dramatic incidents to make a case for planning. The overall consequence is a very fragmented system, a collection of decentralized emergency organizations, with inadequate resources which mostly expects to deal with disaster problems on an ad hoc and individualistic basis drawn from routine ways of responding to emergencies.

However, a few of the emergency agencies, such as one of the fire departments and one of the civil defense offices, have attempted to take some initiative and have made some moves towards developing coordination. Most local organizations are either indifferent or uninterested in such activities. They will, in fact, resist when efforts to change the existent state of affairs threaten to impinge on their own domains. Nonetheless, the few active organizations discussed herein, represent the elements which could form the core of a preparedness program if any major effort toward coordinated community disaster preparedness is attempted in the future. This last is not a likely probability, but even in the JMA possibilities for planning for disasters in the future are not totally absent.

CHAPTER V

OVERALL IMPRESSIONS AND IMPLICATIONS

This chapter is devoted to a discussion of the general impressions which can be derived from our overall study and the specific case studies detailed in the previous chapters. Despite the fact that the picture might appear to be rather bleak, some positive implications for community chemical disaster preparedness which might be drawn from this work are also pointed out.

Overall Impressions

In an earlier publication (Unscheduled Events, 1978) some preliminary observations about planning for chemical emergencies were presented. Four of these observations, and the degree to which they are supported by the case studies can be stated as follows:

1. There are certain distinctive patterns noticeable in the local planning for natural disasters. However, no one pattern seems to predominate in planning at the community level for disasters resulting from chemical agents. There is considerable variation nationwide as to who is seen as primarily responsible for planning at the local level, and also in regard to what resources are seen as necessary to deal with the problem of a chemical disaster if it should arise.

This general observation is supported by the case studies. Three different patterns of planning are apparent. In Swisher there is a barely distinguishable effort at preparedness in the public sector, while a very detailed, in depth system has been established in the private sector. However, there is almost no connection between the two systems, and the public emergency organizations have ceded the responsibility for all chemical disasters almost exclusively to the private company. In Gabor there are two somewhat loosely connected systems: a very highly integrated private sector one and a much weaker public system. But while the private sector's preparedness is generally strong, its weaknesses such as poor evacuation planning, are not compensated for by the planning of the public emergency organizations. In the Johnson metropolitan area, there is neither a strong public or private system, although there is more preparedness activity in the latter than in the former community sector. Responsibility for chemical disasters is not specifically assumed by anyone, and there is even little recognition of what the problem might be and what resources are needed to deal with acute chemical emergencies.

2. While there are marked differences from one locality to another, there is relatively little community level planning for chemical disasters. The matter is not seen as a general salient issue in most communities and little effort is directed toward addressing the problem. The problem has low priority in overall community disaster planning. This is true even in localities where there is awareness of the possibilities and potential for local chemical disasters.

This general observation is applicable to at least two of our case studies. Only in Gabor can it be said that preparedness for acute chemical emergencies is

related to overall community disaster planning. And even in Gabor the link between the public and private sectors is weak. Furthermore, in all three communities, planning for chemical disasters, regardless of the degree to which it has been undertaken, is not an integral part of overall community disaster planning for all disaster agents.

3. Omitted from almost all disaster planning for chemical agents is the fact that if the disaster is a very large one, it will probably involve national response teams, and that in the vast majority of cases of sudden disasters, the local police or fire department will be the first responders. Failure to recognize this means that certain crucial interorganizational contacts and interactions likely in actual events may not be any part of an existing plan.

Again, this general observation is consistent with what we found in two of the case studies. Only in Gabor was there an awareness of the possible role which non-local entities might play in a chemical disaster. But even in this community, little importance was attached to the possible first responder role of either the police or fire departments. The lack of either chemical disaster planning or overall community disaster planning in metropolitan Johnson, of course, means very little attention is being paid to improving the preparedness status of first responders, except for the fire department, or how non-local agencies might be integrated with the local response. In Swisher, a similar situation exists, probably reinforced by the notion, which may or may not be valid, that the local chemical company has all the necessary resources and does not need to prepare to call on non-local organizations for assistance.

4. If one major organization in a community takes the lead in preparing and planning for chemical disasters, there is a tendency for other local organizations not to be too active in that respect. Due to the specialized interests and expertise of the lead organization involved, one possible consequence of this is sometimes an unbalanced emphasis in the preparations and planning for disaster tasks and relevant resources.

This observation is clearly illustrated in all three case studies. In Swisher, the chemical company has taken the lead and is allowed almost exclusive responsibility for chemical disaster planning. In Gabor, while the private sector has undertaken elaborate preparedness measures for chemical emergencies, the public community organizations have developed only limited roles for themselves. In the Johnson metropolitan area, the limited preparedness which does exist, is provided by a few of the chemical companies and to some extent by the fire departments.

Overall, as noted earlier, the picture we derive from our case studies is neither reassuring nor encouraging. None of the three communities has anything resembling good overall community disaster planning for disasters in general. In two of the localities, Swisher and Gabor, there is extensive preparedness for in-plant acute chemical emergencies, but none of the areas extend their planning for a chemical accident which would go beyond plant gates for a chemical emergency created by a transportation mishap.

Some Positive Implications

The picture of chemical disaster preparedness just depicted appears very ~~depressing~~ ^{depressing}. Even in localities with a high or relatively high risk for chemical disasters, the planning leaves much to be desired. It follows that in other American communities with lower but still substantial risks from acute chemical hazards, the state of preparedness for acute chemical emergencies is probably even worse.

However, to leave the picture this way, especially for officials concerned with disasters and who have responsibilities to prepare for them, would be both misleading and unnecessarily negative. For one, while the picture is bleak, it is better than what would have been observed just a decade ago. Even in the communities we studied, although not touched upon in much detail in the descriptions, changes which have occurred have been in the direction of more and better planning for chemical disasters in both the public and the private sector. Anyone attempting to initiate or improve planning in this area would be moving with the tide of opinion and action and not against it. Everywhere there is far greater recognition of the problem of chemical disasters than there was just a few years ago. The overall social climate or context is favorable for change.

Second, in most cases, there is something on which to build in most communities. Plant planning for chemical emergencies with a facility is fairly respectable in many instances. This is especially true of the larger chemical companies which produce or store more hazardous materials. Similarly, transporters, railroads more than trucking firms, have an interest in and have developed varying kinds of preparedness for chemical emergencies. Thus, public officials interested in developing or extending chemical disaster preparedness will find, in most localities, some segments in the private sector that have already undertaken some planning. In many, if not the vast majority of instances, it is not necessary to start at ground zero or to assume that there is absolutely no knowledge or interest in the problem anywhere in the community. While crossing the public/private sector line is often difficult, the existence of some chemical disaster planning in the private sphere does give public agencies a base upon which to build and possible allies with which to work. Put another way, there are or can be interorganizational or social relationships in a community which could be positive factors for change.

Third, because the preceeding case studies depict actual rather than ideal situations, they ought to be useful. They indicate some of the problems and difficulties encountered in attempts to achieve chemical disaster preparedness. Communities, with chemical plants or complexes dominating a locality, should recognize they can be seduced into believing the private sector will handle all chemical disaster problems. Localities which have good preparedness for in-plant emergencies should see that different planning is needed if the chemical disaster extends beyond the plant property or if there is a transportation accident. Areas which do have planning, whether in the public and/or private sectors, should be aware, as a result of reading the previous case studies, that the level of chemical disaster preparedness will not be what it might appear to be at a purely effort level unless there is an integration of such efforts. Other examples could be cited, but our general theme is that knowledge and understanding of what prevail in a situation is itself a social resource. As has often been said, knowledge is power and can be used to bring about change.

In talking about social climate, social relationships, and resources, we are, of course, pointing to what our study established early as key factors in the planning process for disasters (see Quarantelli et al, 1979). In this volume we have tried to depict some of the actual social climates, social relationships and resources which exist in three different kinds of American communities. In any locality, planners and policy makers, with respect to chemical disaster preparedness, ought to be able to see some parallels between what has been described in the case studies and what goes on in their own communities, and to draw specific implications appropriate for their particular circumstances. If this volume helps to do this, we have accomplished the purpose of this work as set forth in the first chapter.

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