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JUDGMENTS OF RESPONSIBILITIES FOR DISASTER CONSEQUENCES

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TECHNICAL REPORT

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CHAPTER 1

THE RESEARCH PROBLEM

Disaster and hazards research has raised questions about the extremely complex relationship between causality and responsibility for disaster consequences of both natural and technological hazard agents. Differences in individual perception of and response to threats from natural versus technological hazards have been extensively debated (cf, Baum et al. 1983; Kroll-Smith and Couch 1990) as has the similarity of collective and organizational response to natural and technological disasters (Quarantelli and Dynes 1976).

In the past, it has been argued that natural disaster agents--such as tornadoes, hurricanes, and earthquakes--are "acts of God" that are beyond the realm of human capability to intervene. The emphasis here was on the inability to alter natural geophysical or atmospheric processes to prevent the onset of the disaster agent.

In natural disaster events, observers tend to respond sympathetically to the victims of disaster, rallying around them to provide aid and support. The research on natural disasters shows that victims are rarely seen as responsible for their condition nor are others portrayed as perpetrators of the consequences which rendered them victims. No attributions of responsibility for causation or magnitude of disaster consequences are generally made. Historically, the courts have not as a rule found parties liable for the outcomes of natural disasters.

However, in the late 1970's, the Association of Bay Area Governments (ABAG) undertook an extensive review of tort law to clarify the potential for local government liability for earthquake-related losses (ABAG 1978; 1979; see also Huffman, 1986). Their motivation for examining liability issues was two-fold. The first was that earthquakes, like many other natural hazards, are becoming more predictable and hazard mitigation techniques better established. The second was the trend in the courts toward generally decreasing the immunity of governments (Moore and Yin 1983), especially local governments (Huffman 1986). As a regional planning agency, ABAG was particularly concerned that the uncertainty about liability issues might deter local governments from taking actions to reduce earthquake hazards. In particular, would governments that identified hazardous structures and locations then become liable for losses incurred if the jurisdiction did not take steps to reduce the risk to citizens? If this were the case, there would be a negative incentive for jurisdictions to begin to address questions of hazard and risk because, for most communities and counties, hazard mitigation involved substantial costs.

In contrast to the perception that natural disasters are not within the realm of human responsibility, there has been a definite tendency, across societies, to attribute human responsibility in the case of technologically-created disasters--such as Love Canal, Bhopal, Chernobyl, and the Exxon Valdez. In many studies on technological disasters or environmental hazards, the emphasis is on determining who is to blame for harms to the environment or to public health (cf, Sorenson et al. 1987; Cutter 1984; Flynn 1979). Similarly, the impact assessment literature on the siting of hazardous or noxious facilities considers the practical question of who will ensure that the proposed facility poses no undue harm to the nearby physical and social environments (cf, Lindell and Earle 1989; Mushkatel et al. 1993).

Certainly, extreme environmental pollution incidents and threats to human life and well-being create situations in which the responsible agent is expected to pay for the damage that has been done to victims (including the natural environment). Even when consequences could arguably be defined as negligible--such as in Three Mile Island--potential, perceived harms have been sufficient for citizens to demand major, industry-wide operational changes due to their concerns about a lack of social responsibility on the part of the nuclear power industry (Goldsteen and Schorr 1991).

Recently, however, the differences between these two patterns may have begun to blur. As we learn more about how to predict disasters and how to minimize the negative consequences of natural hazard agents, a greater burden is placed on human actors to do so. Citizens' expectations of prudent land use planning and construction practices increase the likelihood of attributing disaster consequences to those actors involved in these activities, whether they are in the public or private sector. For example, Hurricane Andrew resulted in investigations into design and construction practices in Florida after an extremely high number of dwellings were damaged and their roofs were blown away. In the recent midwest flooding disaster, the Army Corps of Engineers was forced to confront the fact that their primary flood mitigation efforts of levee building may have **increased** rather than reduced the hazard's impact. Similarly, as it becomes more technologically possible to track severe storms, hurricanes, and tornadoes, citizens begin to expect that they will have sufficient warning so that they may take protective actions. When this is not the case, questions of responsibility may be raised about the culpability of scientists and monitoring agencies.

On the other hand, risk analysts (cf, Weinberg 1994) have argued that some technological accidents are calculated to be such rare events that, when they do occur, they should be thought of as "acts of God," in order for victims to be compensated by the Federal government, like they are after natural disasters.

Such a suggestion is contrary, however, to current tort liability for technological hazards resulting from business activity. Biel (1991) notes that the courts have resolved the liability issue of hazardous waste cleanup under the Resource Conservation and Recovery Act of 1976 and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 with the general ruling that "the polluter pays."

Whatever the status of legal liability for disasters, the deployment of Federal resources following a Presidentially declared disaster to victims is strongly affected by political and other factors. Consider the Los Angeles Uprising, which followed the controversial jury acquittals in 1993 of white Los Angeles police officers charged with beating black motorist Rodney King decision in 1993. The Uprising, which included extensive looting and arson, was officially declared a "disaster" and victims were eligible for Federal disaster assistance. Although "fires" are included in the wording of the legislation which defines such events, the extension of a federal declaration to the human destruction of the riot clearly pushed the intent of the legislation to cover a volatile situation.

The interplay between natural and technological hazards, the disasters that result from them, and the attributions of responsibility for their consequences present a complex social phenomenon that has been little studied. Even when there is a recognition that issues of responsibility are critically important, most work on disasters and hazard mitigation has failed to examine systematically the ethical and moral aspects of responsibility prior to the occurrence of a destructive event. The thrust of the research to date has been directed more toward what should be done than toward who should be responsible for carrying out such actions.

THE RESEARCH APPROACH: A STUDY OF RESPONSIBILITY ATTRIBUTIONS

This research project took as its central focus the study of how people make judgments of responsibility in the context of natural and technological disasters. To explore judgments of responsibility for disaster losses and their reduction, this project combined insights from the literature on disasters and hazard mitigation with social psychological research on attributions and judgments of responsibility.

Within the field of social psychology, there is an extensive literature on attributions of responsibility (Fincham & Jaspars 1980; Hamilton 1980; Jones et al. 1972; Karlovac & Darcy 1988; Shaver 1985; Walster 1966). As is well-known, Heider's (1958) pioneering efforts shaped the field of attribution theory. He theorized that in making causal attributions about persons, people take into account the ability and the effort of the individual as well as the influence of environmental factors. The greater the influence of the environment, the less the personal responsibility. He also distinguished among five levels of responsibility attribution:

(1) association, in which people are held responsible for effects that are merely associated or connected to them;

(2) commission, in which people are judged to be responsible if their actions were necessary conditions for outcomes, even if they did not intend the outcomes;

(3) foreseeability, in which people are responsible if they have foreseen an outcome of their action even if it was not an intended outcome;

(4) intention, in which people are held responsible only for what they intended; and

(5) justification, in which aspects of the environment can provide excuses that limit a person's responsibility.

Subsequent work on attributions of responsibility (cf, Shaw & Sulzer 1964; Hamilton 1978) confirmed many of Heider's original insights into how laypeople assess causality and responsibility.

It should be noted that much of the prior attribution theory and research has focused on relatively simple cases, frequently assessing attributions about individual actors operating independently rather than within group or organizational contexts. For example, Shaver (1985) found that within groups, a diffusion of responsibility occurs. While Kelman and Hamilton (1989) maintain that the psychological models developed by attribution theorists have not adequately captured the complexity of organizational, hierarchical relationships which tend to lessen attributed responsibility.

Another issue that has not been adequately addressed by attribution theory or research is whether people follow different patterns in judging the responsibility of group actors such as government agencies or businesses. These group actors are, of course, major players in hazard mitigation. There is very good reason to believe that responsibility attributions about group actors will differ from judgments about individuals. Governments and corporations are organized in hierarchical structures, and populated by individuals with specialized skills and responsibilities. Observers may presume that the government and the business corporation, with all of their intellectual resources, can function in a more thoughtful, forward-looking way than the individual (Hans, 1990). Laypersons appear to hold corporate defendants to a higher standard than individual defendants and are more likely to find corporations than individuals liable even when they have engaged in the same actions and caused the same harm

(Hans & Ermann, 1989; Hans, 1994). Because of matters of scale, governments and business corporations often possess the potential to harm--or to help--a greater number of people, suggesting higher *a priori* levels of responsibility.

Furthermore, psychological research suggests that, for events with serious consequences, groups will be attributed greater responsibility than similarly situated individuals (MacCauley & Jacques 1979) and that more responsibility is attributed to an individual whose actions lead to a severe as opposed to a mild outcome (cf, Walster 1966). When extreme events occur, people tend to infer that substantial causes (or "multiple necessary causes," in the language of attribution theory) must have been present. Therefore, in the face of an extremely serious disaster, people may seek to attribute responsibility to group entities such as design professionals, government, or business rather than individuals.

While little research exists in the area of disaster studies that focuses on attributions of responsibility, the study by Turner et al. (1986) is one exception. The investigators sought to determine the extent to which the public was aware of groups that might be particularly endangered from an earthquake event--such as those in older unsafe structures, hospital patients, and school children--and who was perceived as responsible for reducing the risk exposure of these groups. Although there was widespread awareness of potentially-endangered groups, respondents held a variety of beliefs about the remediability of the risks for those social groups. Assessments of who was responsible for taking these risk reduction actions also varied widely (Nigg 1979). While there was a decided inclination to expect that some level of government was responsible for such actions (with a special emphasis on the federal government), other actors including owners of the structures and managers of institutional facilities were also identified. Significantly, individuals themselves were attributed major responsibility under some conditions, especially those related to their ecological location (e.g, on a steep hillside).

THE METHODOLOGICAL APPROACH

We decided that an experimental research methodology would be an ideal approach to use in order to compare technological and natural disasters and their impact on responsibility judgments. Scenarios were used to provide information to research subjects concerning the nature of the disaster, the context within which it occurs, and the impact (or consequences) of the disaster on local community. Three experiments were conducted in which two scenario components were varied:

(1) the nature of the disaster agent (whether it is natural or technological in origin); and

(2) the severity of the disaster consequences.

The factors held constant in the scenarios included:

(1) the description of the community;

(2) the event history of the community with that disaster agent;

(3) the predictability and probability of the disaster occurrence (from a scientific perspective); and

(4) the level of preparedness of the community for such a disaster (from an emergency management perspective).

The central dependent variables in each study were attributions of responsibility for disaster consequences and hazard reduction activities. (The specific variables considered are discussed in the following chapters.) Appendix 1 contains copies of all of the scenario instruments.

This experimental approach allowed us to separate certain elements of disasters that are usually confounded in the real world and to determine their impact on judgments of ethical and moral responsibility. Our prime purpose was to assess the usefulness of this approach with lay respondents, but we also conducted a pilot study with professional engineers to explore similarities and differences between lay and expert views. Chapters 2-5 describes each of the studies that we conducted as part of the project. Chapter 6 then provides an overview and summary of the findings.

CHAPTER 2

EXPERIMENT 1: INITIAL EXPLORATION OF THE USEFULNESS OF SCENARIO METHODOLOGY FOR STUDYING JUDGMENTS OF RESPONSIBILITY FOR DISASTERS

Experiment 1 was a scenario study that varied the disaster agent and the severity of its consequences (see Figure 2.1). Subjects in the Natural Disaster condition received a description of an earthquake, while in the Technological Disaster condition they read about a toxic emission from a manufacturing plant. Disasters were depicted as having either moderate or severe consequences. Information about the community and the disaster was provided in five separate sections, which included: (1) background information about the community; (2) background information about hazards; (3) initial information about the disaster; (4) information about the predictability of the disaster; and (5) information about disaster losses. Each section was followed by a set of questions, which enabled us to assess the effects of discrete scenario components on subjects' judgments. Copies of these instruments are included in Appendix 1, Experiment 1.

PROCEDURE

Experiment 1 was conducted in an Introduction to Sociology class. A total of 180 students participated in the study for extra credit. The researchers introduced the study, briefly explained

FIGURE 2.1

EXPERIMENT 1 SCENARIO DESIGN

Moderate Natural Disaster	Severe Natural Disaster
Moderate Technological Disaster	Severe Technological Disaster

that its purpose was to analyze perceptions of community events, and provided instructions for filling out the questionnaire. Students signed informed consent forms prior to participating in the study. After all students had completed the questionnaires, they were fully informed about the nature of the experiment, the different conditions, and the hypotheses, and were invited to provide their reactions to the study.

QUESTIONNAIRE AND RESULTS

BACKGROUND INFORMATION ABOUT THE COMMUNITY

The questionnaire in all four conditions began by describing the city of Santa Louisa, a community in the central coastal region of California. The city's founding, its primary industries, and its building stock were included in the city description. The facts that it was the site of a state university and a medium security prison were also mentioned. The community, with its low rate of unemployment, expanding high technology industries, good climate, and clean environment, was described in a generally positive way.

After reading the city description, respondents were asked a series of questions about the desirability of Santa Louisa as a place to live. They were asked to assess the quality of life of its residents and to rate how desirable it would be to make Santa Louisa their home. They also were asked to indicate the likelihood of seven negative events occurring in Santa Louisa, including a destructive earthquake and a hazardous chemical release from a manufacturing plant.

These questions were designed to assess whether the scenario had successfully depicted Santa Louisa as a positive place to live and whether the experimental groups differed in their a priori expectations about the likelihood of disasters in the community. Because all subjects received the same information about the community, no significant differences among experimental conditions were anticipated.

Respondents in the four experimental conditions rated the quality of life in Santa Louisa favorably, with a mean response of 7.80 on a 10-point scale. Respondents considered it a desirable place to live (M = 1.78, where 1 = very desirable and 2 = somewhat desirable). As expected, there were no significant differences among the groups in their overall evaluation of Santa Louisa. The perceived likelihood of an earthquake was relatively high (M = 7.11 on a 10-point scale), but did not differ between groups. However, by chance, the perceived likelihood of a chemical release (overall M = 6.00) was higher in the moderate consequences condition (M = 6.31) than in the severe consequences condition (M = 5.69, F (1, 179) = 5.33, p = .02).

BACKGROUND INFORMATION ABOUT HAZARDS

The second section provided more information about either natural or technological disasters, depending on the experimental condition. The Natural Disaster subjects were given information that Santa Louisa had experienced several small earthquakes over the past 20 years. According to the scenario, community residents were not very concerned about the fact that an earthquake fault existed near the city. Similarly, in the Technological Disaster condition, respondents learned about several small hazardous materials spills or releases over the past 20 years. Residents of Santa Louisa were said to be unconcerned about safety problems from the local manufacturing plant that used certain toxic chemicals in processing. In both conditions, city agencies were described as having undertaken only a modest amount of disaster planning. The wording was identical in all conditions:

> City agencies (particularly the Police Department, the Fire Department, and the Emergency Management Office) have done some disaster response planning, covering a wide range of disasters that could happen in the city. This will enable them to work more effectively to lessen life loss if a disaster occurs in the city. However, city officials have not undertaken any actions that would improve the safety or safe operation of any of the buildings or facilities in the city, mainly because the city lacks the money to do so.

Respondents then rated the appropriateness of the level of concern and preparation of Santa Louisa residents and public officials regarding potential disasters, and indicated how concerned they would be for their safety if they lived in Santa Louisa, how much trust they would have in officials to respond to a disaster, and how much action the residents should take to prepare themselves for a disaster. Finally, in light of the new information, they again rated the quality of life in the community.

Any distinctive reactions to natural versus technological disasters were expected to influence reactions to the background information that was presented in the second section. No effects of the severity of the disaster were expected, since the background information was the same for both moderate and severe disasters.

After having been provided with information about the potential for a disaster in Santa Louisa, respondents thought that residents should be more concerned about their safety than they currently were (M = 1.17 on a 3-point scale, where 1 = more concerned and 3 = less concerned). The respondents also thought that public officials should be more concerned (M = 1.12). Respondents were asked whether, if they themselves were residents of Santa Louisa, they would be more concerned or less concerned than everyone else. They indicated that on average they would be more concerned than others about their safety (M = 1.41). Judgments about appropriate levels of concern were not influenced by the natural versus technological nature of the hazard.

In terms of preparedness, respondents thought that Santa Louisa residents should take some action to prepare for an earthquake or a chemical emission (M = 1.77, where 1 = a lot of action and 2 = some action). More preparation by residents was recommended for earthquakes (M = 1.68) than for chemical emissions (M = 1.87, F (1, 179) = 5.37, p = .02). Less trust was placed in local agencies to respond to a chemical emission (M = 2.42, where 2 = some trust and 3 = not much trust) than to an earthquake (M = 2.21, F (1, 179) = 5.66, p = .02).

Although information about either a natural or a technological hazard reduced the rated attractiveness of Santa Louisa (overall $M = 6.30$, down from the 7.80 initial rating), the technological hazard had a greater negative impact on the desirability of the community (Natural Disaster $M = 6.59$, Technological Disaster $M = 6.01$; $F(1, 179) = 9.60$, $p = .002$).

INITIAL INFORMATION ABOUT THE DISASTER

The third, fourth, and fifth sections of the questionnaire presented information about a disaster occurring in Santa Louisa. Basic information about the disaster was presented in the third section, and varied depending on the experimental condition. In the Severe Natural Disaster condition, respondents read the following:

> At 10:05 on a Wednesday morning in November, 1992, a 7.9 earthquake rocked the city of Santa Louisa and its surrounding suburbs. The earthquake resulted from the movement on a known fault--the Los Osos Fault--that had not been active recently. The fault is about 3 miles from the city center, just beyond the city limits.
>
> The initial earthquake shock shook the ground for over 50 seconds, a relatively long time for an earthquake in this area. The earth then continued to vibrate for several minutes following the quake's major shock.
>
> Because the soils underneath the city are uncompacted alluvial sediments, the earthquake caused all areas of the city to experience extreme and prolonged shaking. The damages and losses from the earthquake

occurred throughout the city--in its downtown center as well as its surrounding residential and business park areas. However, few other nearby communities sustained any damage or losses from this earthquake event.

In the Moderate Natural Disaster condition, respondents learned instead that the earthquake registered 5.2 on the Richter Scale, which rocked the ground for about 8 seconds. The different areas of the city were described as experiencing only "some" shaking.

Parallel information was provided in the Moderate Technological and Severe Technological conditions:

> At 10:05 on a Wednesday morning in November, 1992, a toxic gas cloud was accidentally released from one of the city's plants that manufactured umbrellas from recycled plastics. The toxic gas--pentatetride cyclobromine--is usually harmless when mixed with other chemicals during the manufacturing process. However, in its pure state, the chemical can cause severe breathing problems in humans and animals which can, in some cases, result in long-term lung disease or even death. In high enough concentrations, it can also contaminate soils to the extent that food may not be able to be grown in that soil for several years.

In the Severe Technological Disaster condition, the text continued:

> Because of the strong, low winds on the day of the release, the gas cloud remained low to the ground and was disbursed across the entire community within several

minutes, permeating the downtown center as well as its surrounding residential and business park area. By the time the cloud reached the outskirts of the city, it was still potent enough to cause damage in farm animals and to contaminate hundreds of acres of farm land and vineyards.

In contrast, in the Moderate Technological Disaster condition, respondents learned that because there was little wind on the day of the release, the gas cloud rose to about 30 feet off the ground and was disbursed over a relatively small area of the city within several minutes. The cloud was described as "wafting" across the city and becoming diluted well before reaching the outskirts. Whether it could still contaminate farm crops in the area was said to be an open question.

After this initial information about the disaster, a series of questions asked subjects to estimate the severity of its consequences. In addition to general questions about severity and disruption of daily life, respondents were asked to estimate how many people might be killed or injured. Because natural and technological disasters typically cause different types of economic damages, we asked somewhat different questions about economic damages for the two types of disasters. For the earthquake, respondents estimated the percentages of commercial structures and residential dwellings that were destroyed or severely damaged in the disaster. For the toxic emission, respondents predicted the proportions of livestock that would be killed or harmed, and the agricultural crops that would be killed or made inedible, by the toxic cloud. The questions served twin functions: to check the severity manipulation, and to explore whether earthquakes and chemical emissions were seen as equally severe in people's minds.

The severity manipulation was successful, with respondents rating the severe versions of the two disasters as having more serious consequences than the moderate versions (Moderate Disaster conditions $\underline{M}$ = 1.34, and Severe Disaster conditions $\underline{M}$ = 2.00, where 1 = very severe and 2 = somewhat severe; $\underline{F}$ (1, 179) = 59.87, $\underline{p}$ < .001). Respondents thought that more people would be killed in the Severe Disaster ($\underline{F}$ (1, 179) = 13.05, $\underline{p}$ = .001) or injured ($\underline{F}$ (1, 178) = 18.90, $\underline{p}$ < .001) than in the Moderate Disaster conditions. In addition, the technological disaster was rated as more severe ($\underline{M}$ = 1.53) than the natural disaster ($\underline{M}$ = 1.81; $\underline{F}$ (1,179) = 11.67, $\underline{p}$ = .001). However, the number of people expected to be killed or injured in the two different types of disasters were similar.

In the Natural Disaster conditions, respondents estimated the percentages of commercial structures and residential dwellings damaged by the earthquake, while in the Technological Disaster conditions, respondents predicted the proportions of livestock and agricultural crops damaged by the toxic cloud. In each instance, as expected, the Severe Disaster conditions produced higher estimates of economic damages than the Moderate Disaster conditions (all $\underline{p}$'s < .001). Although one cannot directly compare the natural and technological conditions for this set of questions, it is interesting that the percentages were highest in the Technological

Disaster conditions. For example, in the Natural Disaster conditions, respondents predicted that 32% of the commercial buildings and 35% of the residences would be damaged. In contrast, in the Technological Disaster conditions, respondents predicted that 43% of the livestock and 49% of the crops would be damaged. The higher percentages converge with other responses reflecting the greater anticipated severity of the technological disaster.

Respondents were asked to consider how much the disaster's consequences were likely to interfere with the daily lives of the residents of Santa Louisa. They expected the disruption to be greater in the Severe Disaster conditions (M = 1.31, where 1 = very disruptive and 2 = somewhat disruptive) than in the Moderate Disaster conditions (M = 1.82; F (1, 178) = 36.17, p < .001). Similarly, when asked about how concerned they would be for their own safety if they were residents of Santa Louisa at the time of the disaster, they expressed greater concern in the Severe Disaster conditions (M = 1.11) than in the Moderate Disaster conditions (M = 1.36; F (1, 178) = 12.70, p < .001). They also rated their concern as higher in the Technological Disaster conditions (M = 1.13) than in the Natural Disaster conditions (M = 1.34; F (1, 178) = 9.02, p = .003).

PREDICTABILITY OF THE DISASTER AND JUDGMENTS OF RESPONSIBILITY FOR A WARNING SYSTEM

The next section presented information about the predictability of the disaster. In both the Moderate and the Severe Natural Disaster conditions, respondents read the following:

The earthquake was not predicted. Scientists had previously mapped the fault and determined that it was "active" (in geologic terms, which means that the fault has moved within the last 7,000 years). It was believed that an earthquake of this magnitude was very unlikely in the near future. Scientists know, however, that an earthquake can occur at any time on an active fault.

Because the event was not predicted, residents of the area had no warning that an event was imminent or even very likely to occur. Scientists were, in fact, surprised that the fault was capable of producing an earthquake of this magnitude.

Technological Disaster subjects were given parallel information that a toxic emission was a low likelihood event:

The accidental release of this chemical was believed to be very unlikely by the scientists who conducted risk assessment studies for the city before the plant was built. They calculated that such an event was a very low probability event (that is, it would only occur about once in 7,000 years. Over the expected life of the plant, that means that the risk of such an event was extremely low.) This plant was relatively new and had many safeguards and backup systems to prevent a release of this toxic chemical into the air. Scientists were, in fact, surprised that a toxic chemical emission of this size could take place.

> Although the leak was discovered quickly and the release stopped, a [large/relatively small quantity] of the chemical was emitted. The emission of the gas and its rapid dispersion across the community took place so quickly that no warning was given to community residents within the first several minutes.

After the probability information, subjects were asked about the responsibility of scientists, local officials, plant owners, and community residents for conducting research or developing a warning system. They were first asked: "Even though scientists believed that [an earthquake of this magnitude/a toxic chemical emission of this size] was unlikely to occur, should the scientists have done more research to know more about the [earthquake possibilities/ possibilities of such a leak]?" Second, respondents were asked: "Although this event was believed to be very unlikely, should local officials, working with the scientists, have tried to develop a warning system, even if it might only give a few seconds of warning to the community's residents?" Finally, they were asked to indicate whose responsibility it is to get such a warning system developed, and provided with four different groups: scientists, local officials, plant owners, and community residents.

We hypothesized that actors might be attributed greater responsibility for the severe than for the moderate disasters. In addition, if technological failure is seen as more predictable and more controllable than a natural disaster such as an earthquake, then we would expect more attributed responsibility in the Technological Disaster conditions.

Interestingly, the disaster's severity made a difference in the perceived necessity of scientific research, but in a direction opposite to the hypothesis. Respondents believed that more scientific research was needed about the possibilities of an earthquake or a toxic emission in the Moderate Disaster conditions ($\underline{M}$ = 1.78, where 1 = a lot more research and 2 = some research) than in the Severe Disaster conditions ($\underline{M}$ = 1.54, $\underline{F}$ (1, 178) = 4.55, $\underline{p}$ = .034).

Respondents were more likely to think that a warning system should have been developed to alert residents about a pending event in the Technological Disaster conditions ($\underline{M}$ = 1.30, where 1 = definitely and 2 = probably) than in the Natural Disaster conditions ($\underline{M}$ = 1.50; $\underline{F}$ (1, 179) = 4.13, $\underline{p}$ < .05). Subjects rated the responsibility of various parties for developing such a warning system on a 10-point scale. Results are presented in Table 2.1. As can be seen in Table 2.1, local officials were given the highest responsibility for developing a warning system. Close behind them were the owners of the manufacturing plant in the Technological Disaster condition. The responsibility of scientists was rated in the middle. Owners of buildings in the Natural Disaster condition, and residents in both conditions, were given the least responsibility for developing a warning system.

Interestingly, the severity of the disaster event had different impact for plant owners and building owners. In the

TABLE 2.1

RESPONSIBILITY FOR DEVELOPING OF A WARNING SYSTEM BY TYPE OF DISASTER[1]

GROUP	NATURAL DISASTER	TECHNOLOGICAL DISASTER
Local Officials	9.0	8.8
Plant Owners[2]	---	8.8
Scientists	6.9	7.3
Building Owners[2]	6.3	---
Residents	6.3	5.7

[1]Respondents replied using 10-point scale, where 1 = No Responsibility and 10 = High Responsibility.

[2]Significant effect for Disaster Severity.

Technological Disaster condition, the plant owners were seen as <u>more</u> responsible for developing a warning system when there had been a serious toxic emission ($\underline{M}$ = 9.25) than when the chemical emission was moderate ($\underline{M}$ = 8.33). In contrast, building owners were seen as <u>less</u> responsible for the warning system for a severe earthquake ($\underline{M}$ = 6.15) than for a moderate earthquake ($\underline{M}$ = 6.52).

<u>DISASTER LOSSES AND JUDGMENTS OF RESPONSIBILITY</u>

While maintaining plausibility for each type of scenario, we attempted to keep as similar as possible across the natural and technological disaster conditions the overall amount of disaster damages. Therefore, both the natural and technological hazards were described as resulting in approximately the same amount of loss of life and property damage.

Severe disasters were described as having greater loss of life and property damage than moderate disasters. In the Severe Natural and Technological Disaster conditions, there were 89 deaths, 450 injuries that needed medical treatment, thousands of other minor injuries, and temporary evacuation of 4,000 families from their homes. Economic damages were estimated at $2 billion. In contrast, in the Moderate Natural and Technological Disaster conditions, 9 deaths, 78 injuries requiring medical attention, hundreds of other minor injuries, the temporary evacuation of 200 families, and $200 million in economic losses were attributed to the disaster.

Although we attempted to describe the consequences for natural and technological disasters as similarly as possible, in keeping with the characteristic nature of toxic chemical emissions, we added the following paragraph in the Technological Disaster conditions only:

> Long-term health consequences to the population were unknown in the weeks following the event. Although many people had not immediately sought treatment for respiratory ailments, health complaints continued to be reported for some weeks following the event. Sometimes the health consequences associated with exposure to this gas do not show up for several months.

After reading the final section, respondents again provided their assessment of the severity of the disaster's consequences for the community. We attempted to make the damages comparable for the natural and technological conditions, but greater for the severe than the moderate disasters. We were successful; the respondents' ratings of the severity of the disaster's consequences for the community were greater in the Severe Disaster ($\underline{M}$ = 1.17) than in the Moderate Disaster conditions ($\underline{M}$ = 1.50; $\underline{F}$ (1, 178) = 16.99, $\underline{p}$ < .001). In contrast to their earlier ratings of the severity of the disaster, which differed for the natural and technological disasters, there were no differences in rated severity by the type of disaster ($\underline{M}$ = 1.33 for Natural Disaster and $\underline{M}$ = 1.34 for Technological Disaster). It appears that before explicit information is provided, technological disasters are expected to be worse than natural disasters. However, if there is comparable damage, once information about the actual impact is provided, ratings of the consequences of the two types of disasters converge.

The last set of questions asked them to indicate their judgments about the responsibility of scientists, local officials, and local residents for the health and economic consequences that occurred as a result of the disaster. In the Natural Disaster conditions, subjects indicated their view of the responsibility of owners of the damaged buildings for the losses that occurred, while in the Technological Disaster conditions, they were asked about the responsibility of the owners and operators of the manufacturing plant.

Judgments of responsibility for disaster losses are presented in Table 2.2. Not surprisingly, in the Technological Disaster conditions, the plant owners and operators were seen as the most responsible parties. Next in the Technological Disaster conditions were local officials, who in turn were considered the most responsible agents in the Natural Disaster conditions. The attributions of responsibility of scientists, building owners, and residents were lower and very similar to each other, as shown in Table 2.2.

Whether or not the disaster was natural or technological affected judgments of responsibility. Both scientists and local officials were more likely to be held responsible for technological disasters than for natural disasters. However, for judgments of the responsibility of scientists, the severity of the disaster interacted with the type of disaster. Scientists were attributed higher responsibility in severe as opposed to moderate toxic emissions, but in the Natural Disaster conditions the scientists

TABLE 2.2

RESPONSIBILITY FOR DISASTER DAMAGES AND LOSSES BY TYPE OF DISASTER[1]

GROUP	NATURAL DISASTER	TECHNOLOGICAL DISASTER
Plant Owners and Operators	---	1.3
Local Officials[2]	2.2	1.6
Scientists[2]	2.7	1.9
Building Owners	2.7	---
Residents	2.8	2.6

[1]Respondents replied using 4-point scale, where 1 = Very Responsible, 2 = Responsible, 3 = Not Too Responsible, and 4 = Not Responsible at All.

[2]Significant effect for Disaster Type.

were attributed less responsibility for the severe as opposed to the moderate earthquake (Interaction $\underline{F}$ (1, 178) = 4.06, $\underline{p} < .05$). The responsibility of residents was perceived to be about the same in all experimental conditions.

DISCUSSION

Experiment 1 yielded some interesting data on the factors that influence responsibility judgments in disaster contexts. First, although we made strenuous efforts to describe comparable natural and technological disasters, people differentiated between them. Before learning about the actual impact of the different disasters, the respondents rated the technological disaster as producing more severe consequences than the natural disaster. They expressed more worry about the technological disaster. Even after learning that the impact of natural and technological disasters was approximately the same, the technological nature of a disaster influenced the subjects' judgments of responsibility for disaster losses, with greater responsibility attributed to the plant owners, local officials, and even scientists for technological disaster losses. This differentiation of natural and technological disasters is quite consistent with prior research literature showing the distinctive reactions people have to technological hazards.

Although we were successful in describing disasters of different severity, the variation of a disaster's severity had only modest effects on responsibility judgments. Intuition, and some research, suggest that more severe disasters may create greater demand for accountability. No such pattern was found in the current study. Indeed, in several instances, judgments of responsibility went the opposite direction. For example, scientists were held more responsible for moderate earthquakes than for severe ones. Even though we presented the same information about the low predictability of the event in the Moderate Disaster and Severe Disaster conditions, subjects may have believed that more moderate natural disasters were to be anticipated and that it was the responsibility of scientists and others to be prepared for moderate natural disasters. Severe natural disasters, in contrast, may have been viewed as so unusual and extreme that they could not be prepared for--almost like an Act of God rather than an event whose consequences could be mitigated. Judgments of responsibility for technological disasters, it should be recalled, did not follow this pattern.

Throughout their responses, subjects reflected a strong desirability for controlling the likelihood and impact of disasters. Even for the natural disaster, attributed responsibility was substantial. Especially interesting from a public policy standpoint is the pivotal role that local officials are seen as playing in both natural and technological disaster mitigation. At the same time, there appears to be some resistance to attributing responsibility to the residents of a city struck by disaster. Even though respondents thought residents were not sufficiently concerned and should be more prepared for a disaster event, they may have been reluctant to assess responsibility against actors who were the most similar to themselves.

Experiment 1 represents an initial step in illustrating a method for examining judgments of responsibility for disasters. Yet it examined only a few aspects of responsibility: specifically, responsibility for actions that could mitigate the impact of disasters, such as undertaking scientific research and developing a warning system; and responsibility for the damages and losses from the disaster. It would be desirable to expand the dimensions of responsibility. In addition, it would be useful to explore attributions of responsibility for other actors who might be held accountable for disaster mitigation and compensation. Experiment 2 was designed with these modifications in mind.

CHAPTER 3

EXPERIMENT 2: ATTRIBUTIONS OF RESPONSIBILITY BEFORE AND AFTER DISASTERS

In Experiment 1, we demonstrated the utility of the scenario method for studying judgments about responsibility in the context of disasters. Experiment 2 builds on Experiment 1, but expands the domain of inquiry in two ways. Experiment 1 showed that respondents strongly favored action to control or mitigate disasters, but we provided them with only two specific actions to consider: conducting scientific research and developing a warning system. We also asked respondents just one global question about post-disaster responsibility for disaster losses. To obtain a more differentiated picture about the dimensions of responsibility that appear to be crucial to people, Experiment 2 augments the types of pre-disaster actions and post-disaster compensation and recovery activity presented to respondents.

In Experiment 2, we also increased the number of potential actors who could be held responsible for disaster-related activity. Study 1 explored the attributions of responsibility for a relatively small number of key groups of actors--local officials, building or business owners, scientists, and residents. In the post-experiment debriefing, several of the participants indicated that they believed people at other levels of government should be held responsible for some of the pre-disaster actions or damages stemming from a disaster event, indicating that questions about the responsibility of officials at different levels of government would be useful.

Currently, there is a lively debate about the ethical responsibilities of professionals to design and construct safe buildings and systems (see generally Mayo & Hollander, 1991). One question is whether professionals have the moral responsibility to exceed government safety standards in their work if they have the technical proficiency to make their products safer. Therefore it was also of interest to determine attributions of responsibility for various professional actors, including architects, engineers, builders, and contractors.

METHOD

The study's design and basic scenario were the same as in Experiment 1. The disaster agent and the severity of its consequences were varied orthogonally. Subjects in the Natural Disaster condition received a description of an earthquake, while in the Technological Disaster condition they read about a chemical emission. Disasters were depicted as having either moderate or severe consequences.

In contrast to Experiment 1, in Experiment 2 all of the information about the community and the disaster was presented in three rather than five sections. Background information about the community comprised the first section. In the second section, material on the potential for a disaster was provided, while the third section presented information about a disaster event and its impact.

Experiment 2 was conducted in three different Introduction to Criminal Justice classes. A total of 156 students participated in the study during regularly scheduled class periods. The researchers introduced the study, briefly explained that its purpose was to analyze perceptions of community events, and provided instructions for filling out the questionnaire. Students signed informed consent forms prior to participating in the study. After all students had completed filling out the questionnaires, they were informed about the nature of the experiment, the different conditions, and the hypotheses. In two classes, the debriefing was conducted during the class period, while in the third class, a written debriefing was distributed later.

BACKGROUND INFORMATION ABOUT THE COMMUNITY AND THE POTENTIAL FOR DISASTER

Scenario information was the same as in Experiment 1, but presented in three rather than five sections as outlined above. Some questions were dropped, other questions were added, and most response alternatives were changed to 10-point scales for greater comparability across questions. Only one quality of life question ("From what you now know about Santa Louisa, how would <u>you</u> assess the quality of life its residents experience?") was asked. Following the material on the potential for a disaster event in Santa Louisa, the same questions as those in Experiment 1 on concern, trust, necessary action, and quality of life were asked.

A series of questions about the importance of various disaster assessment and mitigation activities was added. Respondents were asked to indicate how important they thought it was that certain actions be taken in Santa Louisa. The specific actions included: conducting a scientific assessment of the likelihood that a major [earthquake/emission of a toxic chemical from one of the manufacturing plants] could affect Santa Louisa; conducting an assessment of how vulnerable the community would be if a major [earthquake/chemical emission] occurred; designing and building new structures that [are resistant to earthquakes/use toxic chemicals that are less likely to have accidental emissions]; requiring that older [buildings/plants] be strengthened so they will [not collapse in an earthquake/be less likely to fail, that is, have chemical emissions]; educating the community about the risk of [an earthquake/a toxic emission] and about what to do if it occurs; strengthening and enforcing building codes and land use regulations that would reduce [earthquake damage/the likelihood that a toxic chemical emission would harm the community]; developing a warning system for [earthquakes/toxic chemical emissions]; and purchasing [earthquake] insurance.

Then, respondents indicated "who, if anyone, is responsible" for undertaking each of the specific actions, on 10-point scales, where 1 = no responsibility and 10 = high responsibility. The potentially responsible parties included federal government officials, state government officials, local government officials, scientists, architects and engineers, builders and contractors, business owners, and community residents. In the Technological Disaster conditions, the category of business owners was divided up into the owners of the chemical plants, the operators of the chemical plants, and other business owners.

As in Experiment 1, respondents saw Santa Louisa as a desirable place to live, with a mean of 7.74 on a 10-point scale measuring desirability. Information about the potential for either an earthquake or a toxic chemical emission, however, influenced their judgments, with the average rating for desirability dropping to 6.51 after that information was presented. As in Study 1, community ratings were more negative in the Technological Disaster condition ($\underline{M}$ = 6.24) than in the Natural Disaster condition ($\underline{M}$ = 6.79; $\underline{F}$ (1, 155) = 9.38, $\underline{p}$ = .003).

Respondents thought that public officials should be concerned about the safety of the city's buildings and communities ($\underline{M}$ = 8.25) and that they themselves would be concerned if they were residents of Santa Louisa ($\underline{M}$ = 7.45). They believed that the current residents should undertake a fair amount of action to prepare themselves and their families for a disaster ($\underline{M}$ = 7.63, where 10 = a great deal of action). Respondents thought that residents should be more concerned about their safety considering the use of toxic chemicals in the manufacturing process ($\underline{M}$ = 7.54) than considering the possibility of an earthquake ($\underline{M}$ = 6.76, $\underline{F}$ (1, 154) = 6.66, $\underline{p}$ .011). As in Study 1, they had more trust in the local agencies' ability to deal with a large earthquake ($\underline{M}$ = 5.82) than with a large toxic chemical emission ($\underline{M}$ = 4.94; $\underline{F}$ (1, 155) = 9.38, $\underline{p}$ = .003).

RESPONSIBILITY FOR PRE-DISASTER ACTIONS

Table 3.1 presents the importance ratings for actions that mitigate or lessen the likelihood of a disaster. One of the first lessons of the table is that all of the mitigation and preparation activities were considered to be quite important. The lowest rating was 7.19 on a 10-point scale. Educating the community, especially in the Natural Disaster conditions, was rated as one of the most crucial activities. Reinforcing old structures and designing and building new structures that lessen the likelihood or impact of disasters, enforcing building codes, and developing warning systems were all actions that respondents strongly endorsed. Scientific studies of the risk of a disaster and of the vulnerability of the community to a disaster were also deemed important. The least important activity overall was purchasing insurance.

There were few statistically significant differences among experimental conditions in the rated importance of disaster mitigation actions. Disaster Severity had no main or interaction effects, as expected, since information about the extent of the disaster was presented to respondents later in the questionnaire. A scientific assessment of the likelihood of a technological disaster was considered more crucial than a scientific assessment of the likelihood of a natural disaster (F (1, 155) = 6.18, p =.014). And although the alternatives were worded somewhat differently in the Natural and Technological Disaster conditions, strengthening older plants so that they were less likely to have chemical emissions was rated as more important than strengthening

TABLE 3.1

RATED IMPORTANCE OF DISASTER MITIGATION ACTIVITIES[1]

ACTIVITY	TYPE OF DISASTER NATURAL DISASTER	TYPE OF DISASTER TECHNOLOGICAL DISASTER
Educate Community	8.87	8.71
Require Older Plants to Be Strengthened	----	8.92
Design and Build New Plants Less Likely to Emit Toxic Chemicals	----	7.99
Require Older Buildings to Be Strengthened	8.54	----
Design and Build Earthquake Resistant Structures	8.51	----
Strengthen and Enforce Building Codes	8.28	8.61
Develop Warning System	8.22	8.69
Vulnerability Assessment	8.20	8.54
Purchase Insurance	7.83	7.19
Scientific Risk Assessment[2]	7.63	8.40

[1]Respondents rated importance on 10-point scales, where 1 = not at all important and 10 = very important.

[2]Significant difference between Natural and Technological Disaster conditions.

older buildings so that they would not collapse in an earthquake (F $(1, 155) = 4.32$, $p < .04$).

RESPONSIBILITY FOR DISASTER MITIGATION

The examination of respondents' judgments of responsibility for disaster mitigation produced some interesting results. The data are best appreciated when presented in categories of potentially responsible parties: government; professionals; businesses; and community residents.

Governmental Responsibility. The responsibility attributed to local, state, and federal governments is presented in Table 3.2. Overall, the amount of governmental responsibility that respondents perceived was quite high, particularly for local governmental officials. And the comparison of the different levels of governmental responsibility for disaster mitigation actions reveals a striking pattern: In every instance, local government was held most responsible, federal government was deemed least responsible, and state government responsibility was in between.

There were virtually no differences in the responsibility of government officials for natural versus technological disaster mitigation. Of the 30 possible opportunities, there were only one or two significance tests that exceeded the .05 level, about what would be expected by chance. Although the alternatives were not described in exactly the same way in the Natural and Technological Disaster conditions, the federal government was held more responsible for requiring that older plants be strengthened so that they would be less likely to emit chemicals in the Technological

TABLE 3.2

MEAN SCORES[1] ON GOVERNMENTAL RESPONSIBILITY FOR DISASTER MITIGATION

ACTIVITY	LEVEL OF GOVERNMENT		
	LOCAL	STATE	FEDERAL
Strengthen and Enforce Building Codes	9.39	8.67	7.46
Educate Community	9.16	7.81	6.45
Develop Warning System	9.14	8.07	6.94
Require Older Plants to Be Strengthened	9.07	8.21	7.05
Scientific Risk Assessment	8.87	7.95	6.28
Require Older Buildings to Be Strengthened	8.87	7.52	5.96
Vulnerability Assessment	8.66	7.67	6.19
Design and Build New Plants Less Likely to Emit Toxic Chemicals	8.16	7.42	6.38
Design and Build Earthquake Resistant Structures	7.97	6.92	5.52
Purchase Insurance	6.57	5.58	4.72

[1]Respondents rated responsibility on 10-point scales, where 1 = no responsibility and 10 = high responsibility.

Disaster condition (M = 7.05) than for requiring that older buildings be strengthened so that they could withstand earthquakes in the Natural Disaster condition (M = 5.96, F (1, 154) = 6.24, p =.014).

Even though no severity information had been presented to respondents at this point in the questionnaire, by chance there were a few statistically significant differences between respondents who received the moderate versus severe disaster scenarios. Local and state governments were seen as more responsible for enforcing building codes, and the local government was viewed as more responsible for building safer plants in the Moderate compared to the Severe Disaster condition (all p's < .05). There was also a significant interaction between the disaster type and severity: For severe disasters, the federal government was seen as more responsible for developing a warning system for technological (M = 7.42) as opposed to natural disasters (M = 6.22); but in the Moderate Disaster condition, the reverse was the case (Moderate Technological Disaster M = 6.64; Moderate Natural Disaster M = 7.54; (F (1, 153) = 4.59, p = .034).

Professional Responsibility. Table 3.3 presents the attributions of responsibility for various professional actors, including scientists, architects and engineers, and builders and contractors. One can observe that the respondents held these three groups of professionals to relatively high levels of responsibility. In all but a few instances, attributions of responsibility to the professionals were above the midpoint of the

TABLE 3.3

MEAN SCORES[1] ON PROFESSIONAL RESPONSIBILITY FOR DISASTER MITIGATION

ACTIVITY	PROFESSIONAL GROUP		
	SCIENTISTS	ARCHITECTS & ENGINEERS	BUILDERS & CONTRACTORS
Strengthen and Enforce Building Codes	5.03	6.88	7.31[3]
Educate Community	7.03[2]	4.81	4.75
Develop Warning system	6.29	5.36[2]	5.15[2]
Require Older Plants to Be Strengthened	6.46[2]	8.38	8.21
Scientific Risk Assessment	7.73	7.23	6.69[2]
Require Older Buildings to Be Strengthened	4.92[2]	8.27	8.47
Vulnerability Assessment	7.09[2]	6.66[2]	6.45[2]
Design and Build New Plants Less Likely to Emit Toxic Chemicals	7.13	9.26	8.80
Design and Build Earthquake Resistant Structures	6.34	9.36	9.28
Purchase Insurance	4.39[2]	5.22	5.75

[1]Respondents rated responsibility on 10-point scales, where 1 = no responsibility and 10 = high responsibility.

[2] Significant difference in attributed responsibility in the Natural versus Technological Disaster conditions.

[3] Significant interaction between Disaster Type and Severity.

scale. Respondents also differentiated between the responsibilities of scientists on the one hand and the other professional groups on the other.

As shown in Table 3.3, scientists were given the most responsibility for developing a warning system, conducting a risk assessment, conducting a vulnerability assessment, and educating the community. Respondents did not differentiate much between architects and engineers versus builders and contractors, the two groupings that we had established a priori. These groups were seen as more responsible than the scientists for strengthening and enforcing building codes, requiring older plants and buildings to be strengthened, designing and building new structures that would lessen the likelihood of disaster damage, and purchasing insurance.

In marked contrast to the responsibility of governmental agents, where the nature of the disaster appeared to be unimportant, the type of disaster influenced several judgments about the responsibility of professionals. In a number of instances, responsibility was higher in the natural disaster conditions. Builders and contractors were seen as more responsible for undertaking a scientific risk assessment when the danger was an earthquake ($\underline{M}$ = 7.18) than when it was a toxic emission ($\underline{M}$ = 6.21; $\underline{F}$ (1, 155) = 5.55, $\underline{p}$ = .02). A similar pattern was observed for the vulnerability assessment (Natural Disaster $\underline{M}$ = 7.49; Technological Disaster $\underline{M}$ = 5.46; $\underline{F}$ (1, 154) = 22.45, $\underline{p}$ < .001). Likewise, architects and engineers were seen as more responsible for doing a vulnerability assessment for earthquakes ($\underline{M} = 7.68$) than for toxic emissions ($\underline{M} = 5.70$; $\underline{F}$ (1, 154) = 20.60, $\underline{p} < .001$).

Other measures showed greater responsibility attributions in the Technological Disaster condition. In a pattern that was opposite to that of the other professionals, scientists were seen as more responsible for the vulnerability assessment in the Technological Disaster conditions ($\underline{M} = 7.70$) than in the Natural Disaster conditions ($\underline{M} = 6.44$; $\underline{F}$ (1, 154) = 9.50, $\underline{p} = .002$). Scientists' responsibility was perceived to be higher in the Technological Disaster condition for requiring older plants to be strengthened ($\underline{M} = 6.46$) than in the Natural Disaster condition for requiring older buildings to be strengthened ($\underline{M} = 4.92$; $\underline{F}$ (1, 154) = 10.81, $\underline{p} = .001$). Scientists' responsibility for educating the community was seen as greater in the Technological Disaster condition ($\underline{M} = 7.57$) than in the Natural Disaster condition ($\underline{M} = 6.45$; $\underline{F}$ (1, 154) = 6.11, $\underline{p} < .02$). Although purchasing insurance was not seen as an activity that was the responsibility of scientists, people were more likely to hold scientists responsible for the purchase of insurance for a technological disaster ($\underline{M} = 5.10$) than for a natural disaster ($\underline{M} = 3.65$; $\underline{F}$ (1, 151) = 8.35, $\underline{p} = .004$). Finally, architects and engineers as well as builders and contractors were all seen as more responsible for developing a warning system for a technological disaster than for a natural disaster (all $\underline{p}$'s < .001).

Business Responsibility. We expected that the responsibility attributed to businesses would be different in the Natural and

Technological Disaster conditions. After all, the possibility of a technological disaster was linked to the existence and operation of manufacturing plants in the hypothetical city of Santa Louisa. However, in the Natural Disaster condition, it was still possible that businesses could be attributed some responsibility for ensuring that their buildings were safe, purchasing insurance, or engaging in other efforts to mitigate the effects of an earthquake on their employees or customers. Table 3.4 shows the attributions of responsibility for various business actors in the Technological Disaster condition, where questions about the responsibility of plant owners, plant operators, and other business owners were separately assessed, and in the Natural Disaster condition, where the responsibility for the general category entitled "business owners" was measured.

In the Technological Disaster condition, the plant owners' responsibility for disaster mitigation was the highest across all types of actions. Table 3.4 shows that plant owners were seen as the most responsible for undertaking scientific studies of risk, developing a warning system, building safer plants, and even educating the community about the likelihood of a chemical emission. Plant operators generally ranked next in attributed responsibility, and the other business owners in the community were last.

It is interesting to compare the category of "other business owners" in the Technological Disaster condition with that of the "business owners" in the Natural Disaster condition. Although the

TABLE 3.4

BUSINESS RESPONSIBILITY FOR DISASTER MITIGATION[1]

	TECHNOLOGICAL DISASTER			NATURAL DISASTER
	PLANT OWNERS	PLANT OPERATORS	OTHER BUSINESS OWNERS	BUSINESS OWNERS
Strengthen and Enforce Building Codes	7.46	5.93	5.04	5.65
Educate Community	8.43	7.31	4.79	5.16
Develop Warning System	8.99	7.65	4.94	4.64
Require Older Plants to Be Strengthened	8.93	6.76	4.60	----
Scientific Risk Assessment	8.80	7.55	4.51	6.01
Require Older Buildings Be Strengthened	----	----	----	6.89
Vulnerability Assessment	8.61	7.36	4.64	6.15
Design and Build New Plants Less Likely to Emit Toxic Chemicals	8.75	6.54	4.43	----
Design and Build Earthquake Resistant Structures	----	----	----	6.95
Purchase Insurance	8.73	7.37	7.60	9.08

[1]Note. Respondents rated responsibility on 10-point scales, where 1 = no responsibility and 10 = high responsibility.

type of disaster differs, both groups of business owners are similar in that they are not directly responsible for disaster causation. Is their perceived responsibility for disaster mitigation any different? Yes, as Table 3.4 demonstrates. In five of the eight possible comparisons, business owners in the Natural Disaster condition were seen as more responsible for disaster mitigation than other business owners in the Technological Disaster condition. They were seen as more responsible for conducting a scientific risk assessment (F (1, 155) = 14.01, p < .001); for undertaking a vulnerability assessment (F (1, 154) = 13.25, p < .001); and for purchasing insurance (F (1, 150) = 13.55, p < .001). Business owners were seen as more responsible for requiring older buildings be strengthened to resist earthquake damage than for requiring older plants be strengthened to lessen the impact of a chemical emission (F (1, 154) = 26.78, p < .001); and more responsible for designing and building earthquake-resistant structures than for designing and building new plants less likely to emit toxic chemicals (F (1, 154) = 35.60), p < .001). It is an interesting pattern that the general category of business owners was attributed much more responsibility for the natural disaster than for the technological disaster. It seems likely that in the Technological Disaster condition, respondents had the opportunity to hold the plant owners and operators directly responsible for disaster mitigation. Therefore other business owners were relieved of some responsibility. In contrast, in the Natural Disaster condition, because the causal agent was a geophysical event, business owners wound up shouldering more of the burden.

Community Residents' Responsibility. A final set of actors to consider for disaster mitigation are the residents of the community of Santa Louisa. Table 3.5 displays attributions of responsibility for community residents in the Natural and the Technological Disaster conditions. Perusal of Table 3.5 reveals that community residents are not given much responsibility for disaster mitigation, with the exception of purchasing insurance. Indeed, this was expected, because so many of the mitigation activities were more likely to be the province of governmental, professional, or business groups. However, one of the interesting questions is whether the residents are seen as having more responsibility in the Natural or the Technological Disaster conditions. Table 3.5 suggests that their perceived responsibility for mitigation was somewhat higher for natural than for technological disasters. Community members were seen as more responsible for undertaking a scientific risk assessment for a natural as compared to a technological disaster (F (1, 155) = 4.86, $p < .03$); and for designing and building earthquake resistant structures than for designing and building safer plants (F (1, 154) = 7.78, $p = .006$). Similarly, they were more responsible for purchasing earthquake insurance than for purchasing insurance to cope with the effects of a chemical emission (F (1, 150) = 4.06, $p < .05$). However, the insurance purchase main effect was qualified by a significant interaction of the type and severity of the disaster (Interaction

TABLE 3.5

COMMUNITY RESIDENTS' RESPONSIBILITY FOR DISASTER MITIGATION[1]

ACTIVITY	TYPE OF DISASTER NATURAL DISASTER	TECHNOLOGICAL DISASTER
Educate Community	6.84	6.63
Require Older Plants to Be Strengthened	----	5.56
Design and Build New Plants Less Likely to Emit Toxic Chemicals[2]	----	4.55
Require Older Buildings to Be Strengthened	6.03	----
Design and Build Earthquake Resistant structures[2]	5.83	----
Strengthen and Enforce Building Codes	5.24	5.30
Develop Warning System	6.52	5.67
Vulnerability Assessment	6.09	6.00
Purchase Insurance[2]	9.08	8.36
Scientific Risk Assessment[2]	6.07	5.05

[1]Respondents rated importance on 10-point scales, where 1 = not at all important and 10 = very important.

[2]Significant difference between Natural and Technological Disaster conditions.

$\underline{F}$ (1, 150) = 4.06, $\underline{p}$ = .03). In the moderate condition, the means were the same, but in the severe condition, earthquake insurance was seen as more the community's responsibility ($\underline{M}$ = 9.30) than insurance for a chemical emission ($\underline{M}$ = 7.79). Again, no severity information had been presented the subjects at this point in the study, so this is best considered a nuisance interaction, reflecting some initial differences among respondents in the two severity conditions.

POST-DISASTER JUDGMENTS OF DISASTER SEVERITY AND RESPONSIBILITY

In the final section, information about a disaster event, the fact that it was a low probability event, and the damages and losses caused by the disaster were presented (corresponding to the third, fourth, and fifth sections of Study 1). As a manipulation check, respondents were asked to indicate on a 10-point scale how severe the consequences of the disaster were for the community. Then, respondents were asked to ascribe responsibility for various ways of compensating victims or means of recovering from the disaster. In the Natural Disaster conditions, these recovery and compensation alternatives included the following: compensation for deaths and personal injuries due to the earthquake; assistance to help business recover; restoration of ruined public buildings, including schools, the prison, and City Hall; restoration of the Mission; restoration of damaged or destroyed private homes; restoration of damaged or destroyed rental houses or apartment buildings; and removal and clean-up of earthquake-caused debris. The Technological Disaster conditions included somewhat different but generally comparable activities: compensation for deaths and health problems due to the chemical emission; continuing to monitor residents of the community to determine whether delayed health problems are occurring; determining where soils and water were contaminated by the chemical; cleaning up the soils and water that were contaminated by the chemical; assistance to help community businesses and agriculture recover; restoration of public property (for example, the prison's agricultural land and the University's and other schools' athletic fields); and restoration of any private property damaged by the chemical emission. Respondents were again provided with a list of potentially responsible parties (the same list as in the pre-disaster questions) and indicated on 10-point scales their views of the responsibility that each of the parties had for each type of post-disaster action.

After respondents were presented with information about either a moderate or severe natural or technological disaster, depending on the experimental condition to which they had been assigned, they indicated the severity of the disaster's consequences. The overall severity was seen as quite high, with a mean of 8.95 on a 10-point scale. Both the severity and the type of the disaster affected severity judgments. Confirming the success of the severity manipulation, the more severe disaster produced higher ratings (Severe Disaster $\underline{M}$ = 9.15; Moderate Disaster $\underline{M}$ = 8.75; $\underline{F}$ (1, 154) = 5.01, $\underline{p}$ < .03). The Technological Disaster was seen as having more severe consequences ($\underline{M}$ = 9.29) than the Natural Disaster ($\underline{M}$ = 8.61; $\underline{F}$ (1, 154) = 13.15, $\underline{p}$ < .001). This is reminiscent of the results of Study 1, where in a number of judgments respondents demonstrated their greater concern over a technological as opposed to a natural disaster.

INJURY COMPENSATION

Another dimension of responsibility is the responsibility for compensating those injured by a disaster and making the community whole again after a disaster. In many instances, the types of activities that are required after natural and technological disasters are quite different, so in later tables they are listed separately. However, though they may differ in type and severity, personal injuries are common to both varieties of disasters. Thus it is possible to compare directly the attributions of responsibility of various parties for compensating those who are injured in natural and technological disasters. Table 3.6 displays these judgments. There are several points worth noting about the pattern of judgments. First, governmental officials at all levels were perceived as responsible for injury compensation--even for natural disasters. All responsibility judgments for the government officials in both conditions were well above the midpoint of the scale. In the Natural Disaster condition, no other group was attributed much responsibility for compensating for personal injuries; judgments ranged from a low of 2.69 to a high of 3.82, all well below the midpoint of the scale.

Quite a different pattern emerged in the Technological Disaster condition. The owners of the chemical plant were held most responsible for compensation of personal injuries. The plant

TABLE 3.6

RESPONSIBILITY FOR COMPENSATION FOR PERSONAL INJURY CAUSED BY DISASTERS[1]

ACTORS	TYPE OF DISASTER	
	NATURAL DISASTER	TECHNOLOGICAL DISASTER
Federal Government Officials[2]	6.21	7.22
State Government Officials	7.29	7.88
Local Government Officials[3]	7.59	8.35
Scientists[2]	2.69	5.13
Architects and Engineers[2]	3.61	4.90
Builders and Contractors[2]	3.82	4.77
Owners of Chemical Plants	----	9.42
Operators of Chemical Plants	----	6.96
[Other] Business Owners	3.14	3.03
Community Residents[3]	3.15	2.65

[1]Respondents rated responsibility on 10-point scales, where 1 = no responsibility and 10 = high responsibility.

[2]Significant difference between Natural and Technological Disaster conditions.

[3]Significant difference between Moderate and Severe Disaster conditions.

operators were ranked fourth in responsibility for injury compensation. Surprisingly, their attributed responsibility was actually less than that of local, state, and federal officials. Thus, even for injuries stemming from a private business disaster, government was seen as having a fair degree of duty to compensate the injured.

The greater responsibility for compensation for personal injury in technological disasters was reflected in the results of statistical analyses comparing the Natural and Technological Disaster conditions. Federal government officials were held more responsible for compensating for personal injury in the technological as opposed to the natural disaster (F (1, 152) = 4.46, p = .036). Scientists, architects and engineers, and builders and contractors were all seen as more responsible for injury compensation after a technological compared to a natural disaster (Scientists: F (1, 152) = 34.35, p < .001; Architects and engineers: F (1, 150) = 7.81, p = .006; Builders and contractors: F (1, 150) = 4.05, p < .05).

The disaster's severity affected judgments as well. Community residents were seen as more responsible for injury compensation following a moderate disaster (M = 3.36) than a severe disaster (M = 2.46; F (1, 150) = 4.53, p = .035). The same pattern emerged for injury compensation by local government officials (Moderate Disaster M = 8.46; Severe Disaster M = 7.52; F (1, 152) = 4.30, p = .04). No group was attributed significantly greater responsibility for compensation after a severe as opposed to a moderate disaster. It may be that because severe disasters produce such a great amount of personal injury, no group was expected to fully compensate the injured.

GOVERNMENTAL RESPONSIBILITY FOR POST-DISASTER RELIEF

Recovering from a disaster, of course, requires more than just compensating for death and other personal injuries. Table 3.7 presents the data concerning governmental responsibility for other types of post-disaster relief. Once again, the perceived responsibility for government was quite high. After natural disasters, local, state, and federal government officials were held responsible for assisting business, restoring public and private buildings, and cleanup efforts. The same hierarchy of responsibility for disaster mitigation, in which local government was seen as more responsible than state government, which in turn was seen as more responsible than federal government, was also observed in the post-disaster relief judgments.

The perception of governmental responsibility after technological disasters was even higher. Government was seen to be liable for monitoring the health consequences of the disaster, assessing soil and water contamination, cleaning up the contamination, assisting business and agriculture, and restoring public and private property. These responsibilities too were highest for local government, least for federal government, and in between for state government.

Although the alternatives were not worded the same, it was still of interest to compare governmental responsibility for

TABLE 3.7

GOVERNMENTAL RESPONSIBILITY FOR POST-DISASTER RELIEF FOR NATURAL AND TECHNOLOGICAL DISASTERS[1]

ACTIVITY	LEVEL OF GOVERNMENT		
	LOCAL	STATE	FEDERAL
Natural Disaster:			
Assistance to Business	8.54	8.19	7.35
Restoration of Public Buildings	9.13	8.97	7.75
Restoration of The Mission	7.55	7.22	6.10
Restoration of Private Homes	7.96	7.40	6.56
Restoration of Rental Units	7.61	7.21	6.25
Debris Removal and Cleanup	9.32	8.61	7.29
Technological Disaster:			
Monitoring Health of Residents	9.10	8.23	6.96
Determining Soil and Water Contamination	9.34	8.60	7.41
Cleanup of Contaminated Soil and Water	9.23	8.73	7.49
Assistance to Business and Agriculture	9.43	9.06	8.17
Restoration of Public Property	8.95	8.85	7.72
Restoration of Private Property	8.47	7.89	7.06

[1]Respondents used 10-point scales, with 1 = no responsibility & 10 = high responsibility.

assistance to business after a natural disaster with its responsibility for assistance to business and agriculture following a technological disaster. The results of an analysis of variance for this type of post-disaster relief showed that our respondents held local, state, and federal government more responsible following a technological as opposed to a natural disaster (Local Government F (1, 153) = 12.33, p = .001; State Government F (1, 153) = 8.67, p = .004; Federal Government F (1,153) = 4.41, p = .037). However, similar comparisons for restoring public property and restoring private property showed no significant differences. Simple comparisons of the means suggest that there would be no difference for cleanup activities following the two types of disasters.

PROFESSIONAL RESPONSIBILITY FOR POST-DISASTER RELIEF

Table 3.8 shows a very different picture for the attributions of responsibility for professionals. The majority of responsibility judgments were well below the midpoint of the scale. The professional groupings of architects and engineers and builders and contractors were not seen as very responsible for post-disaster assistance. Even for the restoration of public and private buildings following a disaster, a type of activity that might be viewed as the purview of the building trade, the highest rating was only 5.82. The scientists were seen as playing a more essential role in the post-disaster work following a technological event, however. Determining soil and water contamination, cleaning up the

TABLE 3.8

PROFESSIONAL RESPONSIBILITY FOR POST-DISASTER RELIEF FOR NATURAL AND TECHNOLOGICAL DISASTERS[1]

ACTIVITY	PROFESSIONAL GROUP		
	SCIENTISTS	ARCHITECTS & ENGINEERS	BUILDERS & CONTRACTORS
Natural Disaster:			
Assistance to Business	2.39	3.55	3.83
Restoration of Public Buildings	2.49	5.21	5.82
Restoration of The Mission	2.66	4.10	4.29
Restoration of Private Homes	2.48	4.45	5.08
Restoration of Rental Units	2.39	4.55	4.93
Debris Removal and Cleanup	3.20	3.84	4.24
Technological Disaster:			
Monitor Health of Residents	6.64	3.84	3.68
Determining Soil and Water Contamination	9.04	4.49	4.22
Cleanup of Contaminated Soil and Water	6.81	4.44	4.19
Assistance to Business and Agriculture	5.04	4.38	4.38
Restoring Public Property	4.27	4.72	4.81
Restoring Private Property	3.89	4.23	4.27

[1]Respondents used 10-point scales, with 1 = no responsibility & 10 = high responsibility.

contamination, and monitoring the health of residents after a chemical emission were all seen as the responsibility of scientists. They were seen as playing a more critical role following a technological as opposed to a natural disaster. For those types of activities we were able to compare across types of disasters (assistance to business, and the restoration of public and private property), the scientists were held more responsible for assisting after a technological disaster (Assisting Business F (1, 153) = 35.28, $p < .001$; Restoring Public Property F (1, 152) = 21.16, $p < .001$; Restoring Private Property F (1, 152) = 12.05, $p = .001$). In contrast, builders and contractors were seen as more responsible for helping to restore public buildings after a natural as opposed to a technological disaster (F (1, 153) = 3.81, $p = .05$).

BUSINESS RESPONSIBILITY FOR POST-DISASTER RELIEF

Business responsibility judgments for post-disaster relief followed the same pattern as judgments for disaster mitigation. The responses are displayed in Table 3.9. For the chemical emission, plant owners were held most responsible, plant operators next most responsible, and other business owners least responsible for post-disaster activities. Most significant to the respondents was the cleanup of contaminated soil and water, judged to be a prime responsibility of the plant owners. Assessing the contamination and monitoring the health consequences were also viewed as very important actions to be taken by the plant owners. Finally, plant

TABLE 3.9

BUSINESS RESPONSIBILITY FOR POST-DISASTER RELIEF FOR NATURAL AND TECHNOLOGICAL DISASTERS[1]

ACTIVITY	BUSINESS GROUP		
	PLANT OWNERS	PLANT OPERATORS	OTHER BUSINESS OWNERS
Natural Disaster:			
Assistance to Business			6.03
Restoration of Public Buildings			4.64
Restoration of The Mission			4.14
Restoration of Private Homes			3.37
Restoration of Rental Units			4.50
Debris Removal and Cleanup			5.84
Technological Disaster:			
Monitor Health of Residents	7.99	5.98	3.37
Determining Soil and Water Contamination	8.50	6.13	3.87
Cleanup of Contaminated Soil and Water	9.15	6.35	3.72
Assistance to Business and Agriculture	9.08	6.18	4.97
Restoring Public Property	8.44	5.84	4.20
Restoring Private Property	8.60	5.81	3.75

[1]Respondents used 10-point scales, with 1 = no responsibility & 10 = high responsibility.

owners were seen as very responsible for assisting business and agriculture and restoring public and private property.

Although the types of post-disaster relief differed for technological and natural disasters, one can observe that in general the responsibilities of "business owners" following a natural disaster were seen as somewhat higher than the responsibilities of "other business owners" following a technological disaster. One statistical comparison, for assistance to business, was significantly higher in the Natural Disaster condition (F (1, 152) = 4.13, $p < .05$). Other comparisons for restoring public and private property, however, did not show any statistically significant differences for business owners in the two types of disasters.

COMMUNITY RESIDENTS' RESPONSIBILITY FOR POST-DISASTER RELIEF

The final table, Table 3.10, shows our subjects' judgments of responsibility for post-disaster activity following natural and technological disasters. A comparison of the means for the various activities reveals an interesting pattern. Community residents were seen as more responsible for assistance after a natural disaster than after a technological disaster. Only one of the means in the Technological Disaster condition exceeded the midpoint of the scale for attributions of responsibility. In contrast, all six judgments of responsibility for natural disaster relief were above the midpoint. Two of the three statistical comparisons between disaster relief actions (restoration of public and private property) resulted in significantly greater responsibility following a

TABLE 3.10

COMMUNITY RESIDENTS' RESPONSIBILITY FOR POST-DISASTER RELIEF FOR NATURAL AND TECHNOLOGICAL DISASTERS[1]

ACTIVITY	MEAN RESPONSE
Natural Disaster:	
Assistance to business	5.11
Restoration of public bldgs.	5.60
Restoration of the Mission	5.64
Restoration of private homes	7.47
Restoration of rental units	5.21
Debris removal and cleanup	7.59
Technological Disaster:	
Monitor Health of Residents	4.94
Determining Soil and Water Contamination	4.76
Cleanup of Contaminated Soil and Water	4.65
Assistance to Business and Agriculture	5.05
Restoring Public Property	4.06
Restoring Private Property	4.34

[1]Respondents used 10-point scales, with 1 = no responsibility & 10 = high responsibility.

natural disaster (Restoring Public Property F (1, 153) = 10.82, p = .001; Restoring Private Property F (1, 153) = 39.94, $p < .001$). The community residents' responsibility for assisting business recovery was seen as about the same in both the Natural and Technological Disaster conditions.

IMPACT OF SEVERITY

Half of the respondents received a moderate and half a severe disaster. On the basis of past research, we hypothesized that the severity of the disaster would influence responsibility judgments. However, in the analyses we were able to undertake, there were no main or interaction effects of Disaster Severity on attributions of responsibility for post-disaster relief.

DISCUSSION

By expanding the number of disaster-related activities and the number of potential actors, Experiment 2 provided a more differentiated portrait of judgments of responsibility for disasters. The results of this study also reinforce a number of the findings of Experiment 1.

The first set of findings that deserves discussion is the high responsibility attributed to local, state, and federal governments for both disaster mitigation and post-disaster relief and compensation. Even for a chemical spill that was caused by a private, for-profit business, all three levels of government were expected to undertake activities to lessen the damages of such spills in advance, and to compensate and help those who were injured as a result of the spill. As a general rule, local government was seen as most responsible for mitigation and post-disaster assistance, federal government was viewed as least responsible, and state government was in between. Local government's responsibility was reduced somewhat in the face of a severe disaster. One might have expected, as is often the case in actual disasters, that state and federal government would be attributed more responsibility for severe disasters because the extent of the destruction would exceed the capacity of the local government for relief and compensation. However, no greater responsibility for these broader levels of government after severe disasters was found.

Judgments of responsibility for the professional groups varied across specific types of disaster-related activity. In general, for all three groups of professionals, scientists, architects and engineers, and builders and contractors, there was a fairly high amount of responsibility attributed for disaster mitigation. The professional groups were seen as culpable for lessening the likelihood and impact of disasters. However, their responsibility for helping the community to rebuild after a disaster was judged to be only moderate. Only scientists in the Technological Disaster condition showed a different pattern. Scientists were expected to contribute to the community's recovery after the chemical spill. In the respondents' minds, scientists were part and parcel of the technological problems related to the spill, and they had the responsibility to be part of the solution. Our data thus reveal a link between technological disasters and the role and responsibility of scientists.

As for business responsibility, the plant owners in the Technological Disaster condition were attributed high responsibility for disaster-related actions both prior and subsequent to the chemical spill. This was expected in light of the plant's causal role in the disaster. The plant operators were generally seen as less responsible than the plant owners, an interesting result in light of the fact that many chemical emissions are attributed to operator error. Kelman and Hamilton (1989) and Hans (1990) write about the difficulty of attributing responsibility within authority relationships such as those in businesses. It is also worth noting that the rest of the business community was not attributed much responsibility for helping Santa Louisa recover, particularly in the Technological Disaster condition when a specific business culprit could be found. This raises questions about whether there are unique ethical obligations of business. Should businesses, for example, be more or less responsible than the individual residents of a community? A more differentiated picture of business responsibility would be most useful.

The community residents' responsibility for disaster mitigation and recovery was seen as fairly low, especially in the Technological Disaster condition. Our study did not include many actions that residents could take to mitigate a disaster or to help recover from one, and that is something that could be altered in our subsequent research.

Experiment 2 generated some interesting patterns about the responsibility of various parties for disaster mitigation and relief. It also showed some differences in responsibility judgments for natural and technological disasters. Common to both Experiments 1 and 2 are perceptions of greater seriousness for a technological disaster such as a chemical spill compared to an earthquake. In the present study it was difficult to equate post-disaster relief because the typical consequences of technological and natural disasters are so different. In Experiment 3, it was decided to hold constant the types of injuries to determine if the differential perception of seriousness and judgments of responsibility persist.

CHAPTER 4

WHEN IS A FLOOD NOT A FLOOD?

In our first two experiments, we found substantial differentiation in attributions of responsibility due to the disaster agent. Technological disasters were perceived to have much greater negative impact on the community and different patterns of attributions of responsibility. These findings raised questions concerning what it was about the situation in which a technological accident took place that gave rise to such differences; and whether there were any conditions under which a natural disaster would be considered to be like a technological disaster. The core question here was whether the same disaster-causing agent, in two different scenarios--one where the agent occurred due to natural causes, the other due to a failure of technology--would provoke different patterns of responsibility attributions.

Since severe flooding along the Mississippi River and its tributaries had just taken place during the summer and fall of 1993, we were presented with a "real world" scenario that raised precisely these issues. Namely, had the Army Corps of Engineers created flooding problems through their traditional structural mitigation efforts of dam and levee building that merely moved the location of the flooding incidents and increased its severity in those locations? This was the classic case of a hazard reduction intervention that had actually increased the destructiveness of the resulting flood where no levees existed.

In the past, flooding has almost always been seen as an "act of God," where people are incapable of preventing excessive rain from saturating the ground, filling rivers and lakes to capacity, and creating life-threatening, widespread floods. Although severe storm monitoring, with its newest generation of storm-tracking radar, is popularly known, people are still not likely to hold the National Weather Service (or comparable agencies) responsible for extended rainy periods that result in widespread flooding.

In contrast to this view, the rapid onset floods created by the collapse of the Teton Dam in Idaho in the early 1970s and the breaching of a tailings dam on Buffalo Creek about the same time, both of which resulted in deaths and community destruction downstream, were perceived quite differently. In both cases, the owners of the dams were held morally (if not legally) responsible for the deaths and property losses of the downstream victims (Golec 1980; Erikson 1976). The Teton Dam was considered to be such an egregious violation of public safety that states were legislated to establish "safety of dams" programs and to evaluate the structural integrity of all non-Federally owned dams throughout the country to determine which ones should be de-certified. In the past, these types of events have been treated more like technological failures than they have natural disasters, even though the consequences are caused by rapidly rising flood waters.

With this difference in mind, we set about to see whether the experimental treatment of different reasons for the onset of the same agent--flooding--would also result in differential attributions of responsibility. The subjects for Experiment 3 were volunteers in an introductory course in Sociology; 95 students were randomly assigned to the Excessive Rain scenario and 98 to the Dam Failure scenario.

THE SCENARIOS

We again returned to the fictitious community of Santa Louisa as our disaster-threatened community. The same description of the community, as presented in earlier experiments, was given to the subjects before any hazard information was introduced. Then information on the city's history of flooding and preparedness for floods was given.

In this experiment, only the cause of flooding was manipulated. In one scenario, subjects were told about the Santa Susana Dam and its hazard history; in the other scenario, floodplain information was presented to give subjects some sense of the flood hazard to which the community was exposed. Both before and after this information was introduced, subjects were asked to evaluate the quality of life in Santa Louisa to determine whether hazard information had any effect on their assessments.

As seen in Table 4.1, under both conditions, subjects made relatively high assessments about the quality of life in Santa

TABLE 4.1

QUALITY OF LIFE ASSESSMENT

	RAIN	DAM BURST
Pre-Flood Hazard Assessment[1]		
Range	4-10	5-10
Mean	7.75	8.09
S.D.	1.05	1.13
Post-Flood Hazard Assessment		
Range	4-10	4-9
Mean	6.98	7.04
SD	1.20	1.20
N	(95)	(98)

[1]t = -2.19, p = .03

Louisa before introduction of the hazard information; and, by chance, one group of subjects registered slightly higher satisfaction than did the other. However, both assessments of the quality of life declined significantly after the introduction of the hazard information and there was no significant difference between the two conditions, indicating that the treatment effects were highly similar in their influence on the subjects' assessments of community life.

Following the introduction of hazard and mitigation information, subjects were asked to assess how concerned they, other residents, and public officials should be about the safety of community from the flood hazard. In light of the mitigation information, subjects were also asked to determine the extent to which Santa Louisa residents should take actions to prepare themselves for a future flooding incident. These questions were introduced in order to determine whether the hazard information was perceived similarly under both treatments of the hazard agent.

Table 4.2 indicates that the treatments were very similar in the way in which they elicited responses about the levels of concern about safety due to the flood hazard. Subjects believed that public officials should be most concerned about safety and that other community residents' concerns were probably less than their own would be if they resided in Santa Louisa. Table 4.3 indicates that subjects believed residents needed to take additional hazard reduction measures but, again, there was no difference between the two flood hazard treatments. Similarly,

TABLE 4.2

CONCERNS ABOUT SAFETY

	RAIN	DAM BURST
Residents' Concern		
Range	2-10	2-10
Mean	6.72	6.64
S.D.	1.67	1.69
Public Officials' Concerns		
Range	2-10	2-10
Mean	7.80	7.79
SD	1.64	1.64
Respondent's Concern		
Range	1-10	2-10
Mean	7.15	6.86
SD	2.02	2.02

TABLE 4.3

RESIDENTS' NEED FOR ADDITIONAL PREPARATORY ACTIONS

	RAIN	DAM BURST
Range	1-10	3-10
Mean	7.27	7.09
S.D.	1.64	1.59

Table 4.4 shows that subjects put only moderate trust in local and state agencies and that there were no significant differences between the two flood-hazard treatments.

FLOOD HAZARD REDUCTION EFFORTS

Subjects were then given a series of nine preparedness and mitigation activities that could be undertaken to reduce the impact of a flood or its consequences, regardless of the cause of the flooding. These activities included:

1. Conducting a new scientific assessment of the likelihood that a damaging flood could occur in the Santa Susana Valley

2. Conducting an assessment of how vulnerable the community would be if such a flood occurred (that is, how many building, systems, or structures are likely to be severely damaged or washed away)

3. Designing and building new structures that are flood resistant

4. Requiring that older buildings be strengthened or relocated so they will not be washed away by a flood

5. Educating the community about the risk of large floods and about what to do if a flood occurs

6. Strengthening and enforcing building codes and land use regulations that would reduce flood damage

7. Condemning structures that are obviously in danger of being destroyed (that is, structures that are in low-lying areas adjacent to the river) to reduce both life and property loss

8. Developing a warning system for floods so people could evacuate if their homes were threatened by riding water.

9. Purchasing flood insurance

Subjects were then asked to rate the relative importance of each of these items. Table 4.5 indicates that the three most

TABLE 4.4

TRUST IN GOVERNMENT AGENCIES

	RAIN	DAM BURST
Local Agencies		
Range	1-10	1-10
Mean	5.71	6.12
S.D.	1.66	1.84
State Agencies		
Range	1-10	1-10
Mean	5.50	5.84
SD	1.77	1.88

TABLE 4.5

IMPORTANCE OF HAZARD REDUCTION MEASURES

	RAIN			DAM BURST		
	RANGE	MEAN	SD	RANGE	MEAN	SD
Flood Hazard Assessment	1-10	7.82	2.05	2-10	7.92	1.75
Community Vulnerability Assessment	2-10	8.11	1.77	3-10	8.13	1.54
Build Flood-Resistant Structures	3-10	7.92	1.83	4-10	8.36	1.63
Strengthen Buildings	3-10	7.59	1.81	2-10	7.75	1.91
Educate Community	4-10	8.61	1.53	4-10	8.84	1.44
Enforce Building Codes and Land Use Regulations	1-10	8.46	1.54	4-10	8.66	1.37
Condemn Endangered Structures	1-10	7.28	2.28	1-10	7.18	2.09
Develop a Warning System	3-10	8.95	1.32	4-10	9.00	1.30
Purchase Flood Insurance	2-10	8.42	1.70	3-10	8.09	1.86

important items for both treatment conditions were the development of a warning system, education of the community regarding flood hazards and protections, and enforcing building codes and land use regulations. Although there are some minor changes in the ordering of importance, there are no significant differences across the two treatments of flood hazard.

RESPONSIBILITY ATTRIBUTIONS FOR HAZARD REDUCTION EFFORTS

For each of the nine hazard reduction measures, subjects were also asked to determine the level of responsibility specific agents had for undertaking the activity. The purpose here was to determine whether differences in the type of flood hazard--excessive rain or dam failure--created different patterns in the attribution of responsibility for undertaking hazard reduction activities. The agents presented to the subjects were included: the Federal government; the State government; the local government; scientists; design professionals (i.e., architects and engineers); builders and contractors; business owners; and residents in the community.

For all but two of the items, local government was identified as the most responsible agent for undertaking hazard reduction activities. In the two deviations from this pattern, responsibility for constructing flood-resistant buildings was primarily attributed to both architects/engineers and builders/contractors; and community residents were seen as principally responsible for purchasing their own flood insurance.

Table 4.6 presents the summary of overall responsibility for each agent across all hazard reduction measures. Local government was identified as having the major amount of responsibility across all of the items under both conditions but was the only agent that was significantly different for the two conditions. Local government was seen as being significantly more responsible when a dam failure hazard threatened the community.

There were no significant differences between the two flood hazard conditions on most of the mitigation measures when responsibility was ascribed to the different agents. Those items for which no differences occurred included: flood hazard assessment; constructing flood-resistant structures; strengthening existing buildings; educating the community; condemning endangered buildings; and developing a warning system.

On other items, no consistent pattern was discernible for responsibility judgments. There were significant differences between the two flood-hazard conditions on three of the items: scientists were attributed more responsibility for conducting community vulnerability assessments by those exposed to the excessive rain condition than by those in the dam failure condition (Table 4.7); business owners were believed to be more responsible for enforcing building code and land use regulations by those in the dam failure condition (Table 4.8); and both local and state governments were judged to be more responsible for flood insurance provision by those exposed to the potential dam failure scenario (Table 4.9).

TABLE 4.6

OVERALL RESPONSIBILITY FOR HAZARD REDUCTION

	RAIN			DAM BURST		
	RANGE	MEAN	SD	RANGE	MEAN	SD
Federal Government	14-81	52.17	19.21	9-90	52.78	21.00
State Government	30-90	67.55	14.01	13-90	69.33	14.36
Local Government[1]	39-90	76.94	10.91	47-90	79.71	8.33
Scientists	9-83	47.67	16.75	14-90	48.02	17.98
Architects/Engineers	21-87	59.22	15.52	24-90	60.65	14.00
Builders/Contractors	21-88	59.89	15.08	9-90	60.58	15.05
Business Owners	12-77	47.49	14.47	17-80	50.17	14.21
Residents	20-88	57.86	16.13	18-90	59.67	17.12

[1] $t = -1.97$; $p = .05$

TABLE 4.7

RESPONSIBILITY FOR COMMUNITY VULNERABILITY ASSESSMENT

	RAIN			DAM BURST		
	RANGE	MEAN	SD	RANGE	MEAN	SD
Federal Government	1-10	5.74	2.75	1-10	5.87	2.70
State Government	1-10	7.53	2.22	2-10	7.64	2.09
Local Government	2-10	8.72	1.79	3-10	8.91	1.33
Scientists[1]	1-10	6.96	2.36	1-10	6.06	2.63
Architects/Engineers	1-10	7.62	2.33	1-10	7.64	2.42
Builders/Contractors	1-10	7.37	2.43	1-10	7.39	2.59
Business Owners	1-10	5.96	2.51	1-10	6.19	2.76
Residents	1-10	6.34	2.87	1-10	6.35	2.67

[1] $t = 2.48$; $p = .01$

TABLE 4.8

RESPONSIBILITY FOR ENFORCING BUILDING CODES AND LAND USE REGULATIONS

	RAIN			DAM BURST		
	RANGE	MEAN	SD	RANGE	MEAN	SD
Federal Government	1-10	6.92	2.83	1-10	6.74	2.95
State Government	2-10	8.53	1.87	1-10	8.50	1.84
Local Government	1-10	9.27	1.31	5-10	9.46	0.91
Scientists	1-10	4.16	2.74	1-10	4.72	2.83
Architects/Engineers	1-10	6.82	3.02	1-10	7.02	2.74
Builders/Contractors	1-10	7.18	2.81	1-10	7.55	2.43
Business Owners[1]	1-10	5.32	2.90	1-10	6.30	2.65
Residents	1-10	5.01	2.99	1-10	5.61	2.79

[1] $t = -2.45$; $p = .01$

TABLE 4.9

RESPONSIBILITY FOR PURCHASING FLOOD INSURANCE

	RAIN			DAM BURST		
	RANGE	MEAN	SD	RANGE	MEAN	SD
Federal Government	1-10	4.27	3.11	1-10	4.95	3.12
State Government[1]	1-10	5.37	3.41	1-10	6.30	3.16
Local Government[2]	1-10	6.25	3.70	1-10	7.29	2.97
Scientists	1-10	3.60	2.87	1-10	4.03	3.09
Architects/Engineers	1-10	4.54	3.45	1-10	4.48	3.36
Builders/Contractors	1-10	5.43	3.62	1-10	5.17	3.54
Business Owners	1-10	8.67	2.66	1-10	8.63	2.40
Residents	3-10	9.55	1.02	2-10	9.32	1.44

[1] $t = -1.96$; $p = .05$

[2] $t = 2.13$; $p = .03$

RESPONSIBILITY ATTRIBUTIONS FOR DISASTER CONSEQUENCES

At this point, both scenarios presented subjects with an account of a flood disaster--one due to excessive amounts of rain over an extended period and one due to dam failure. In each scenario, the consequences and losses of the two types of flooding events were held constant. Subjects validated this treatment when asked to assess the severity of flood consequences. Both scenarios resulted in very high ratings of severity ($\underline{M}$ = 9.22 for the Excessive Rain scenario; $\underline{M}$ = 9.39 for the Dam Failure scenario); no significant difference was found between the two treatments.

Subjects were then given a list of problematic consequences that occur following disasters that must be dealt with by communities and their residents in order for the community to recover. The consequences listed were tailored to the description of Santa Louisa; these disaster consequences included:

1. Compensation for deaths and personal injuries due to the flood
2. Assistance to help businesses recover
3. Restoration of ruined public buildings, including schools, the prison, and City Hall
4. Restoration of the Mission
5. Restoration of damaged or destroyed private homes
6. Restoration of damaged or destroyed rental houses or apartment buildings
7. Removal and clean-up of flood-caused debris

As was done with the hazard mitigation actions, subjects were also given the same set of agents and asked to assess the extent of responsibility each had for undertaking specific recovery tasks. Table 4.10 presents the attribution of responsibility across all tasks for each agent. Again, we see that local and state governments are the primary responsible agents in general for recovery activities arising from disaster consequences. There were **no** significant differences between the two scenario conditions for any of the agents on any specific action.

DISCUSSION

Experiment 3 investigated similarities and differences in responsibility attributions when the agent was held constant--flooding--but when the cause of the event differed--excessive rain and "natural" flooding vs. flooding due to a dam failure (i.e., the failure of technology). The scenario methodology was found to be successful in presenting and controlling the implications of the background descriptions of the community and the flood hazards as well as the severity of the consequences. We found very few differences across the two treatment conditions, and those that were found did not appear to be systematic.

However, given the lack of differential attribution of responsibility for flood consequences, we may have **overcontrolled** treatment effects. In an effort to keep as many factors constant as possible and vary only the cause of the flood event, we may have eliminated factors that, in the "real" world, tend to differentiate natural from technological disasters.

One possible explanation for the consistency we found between the two flood scenarios may be the elimination of what Slovic

TABLE 4.10

OVERALL RESPONSIBILITY FOR DISASTER COMPENSATION

	RAIN			DAM BURST		
	RANGE	MEAN	SD	RANGE	MEAN	SD
Federal Government	10-70	53.84	14.85	10-70	54.25	13.59
State Government	14-70	59.75	11.24	18-70	61.93	9.58
Local Government	24-70	62.54	10.56	31-70	64.04	7.51
Scientists	7-68	22.63	16.13	7-70	22.68	15.55
Architects/Engineers	7-68	35.11	16.46	7-70	35.91	15.83
Builders/Contractors	7-69	37.91	15.81	7-70	39.04	16.21
Business Owners	7-62	33.78	14.89	7-70	35.42	15.13
Residents	9-64	42.21	13.47	7-70	43.20	14.98

and his colleagues (1980) refer to as "dread." In discussing why it is that people perceive some types of processes, events, or substances to be riskier or more hazardous than others, they suggest that one of the two salient dimensions upon which people judge these risks is dread, entailing a perceived lack of control, a catastrophic potential, fatal consequences, and the inequitable distribution of risks and benefits. Certainly, when one reads Erikson's accounts of the horror that residents of Buffalo Creek felt during the black of night with currents of icy water swirling around them, transporting them away from family and home, one comes to understand the dread with which they remembered the night the tailings dam broke.

In our scenario, we attempted to keep the onset of the disaster relatively constant, without reference to the slowly developing flood produced by excessive rain or to the instantaneous flash flooding that would accompany a dam failure. Perhaps it was just this aspect that is a major component of the definition of a technological accident as a disaster. Certainly, this feature was present in Experiment 1 and 2 with the toxic emission accident. It is possible that there must be some element of "drama" in the technological scenario before the event can be construed as a disaster.

Another potential explanation also exists. Perhaps the perception of a flood, regardless of its cause, is perceived to be a "natural" disaster event--the rising of water and the inundation of communities. The actual causal agent may not have implications for who is judged to be responsible when the disaster is a flood episode. In our scenario, a natural cause (rain) was implicated in the dam failure, and it is possible that subjects focused on the rain rather than the inadequacy of the dam structure in making their judgments of responsibility.

Or, the reason may lay with the use of students as subjects, not because they are students but because of their lack of disaster-related experiences. While this was an experimental study and subjects were given substantial background and hazard information concerning the disaster situations, few of these students had any type of previous disaster experience. In the disaster literature, prior experience in disaster situations is frequently found to have profound effects on levels of personal preparedness and on expectations of community-level mitigation actions taken by governmental actors. It would be very interesting, indeed, to replicate this experimental work with residents of communities that had actually experienced some type of flood disaster to determine how their life experiences might sensitize them to the dread associated with such situations.

CHAPTER 5

PILOT STUDY: ENGINEERS' ATTRIBUTIONS OF RESPONSIBILITY FOR EARTHQUAKE CONSEQUENCES

In the hazards and disaster literatures, most of the research has been conducted from the perspective of community residents, either using survey research to determine residents' attitudes, opinions, knowledge or beliefs related to some specific hazard agent or using a case study approach to look at community dynamics around some disaster event. In the study of responsibility judgments for disaster consequences, we believe that it is also important to include another set of community actors whose professional practice is often at the heart of these assessments--the design professionals.

ENGINEERS AS STAKEHOLDER PROFESSIONALS

Engineers and architects are frequently involved as stakeholders in disasters. When their structures fail, they often cause injury, death, and devastating property losses. Engineers (and to a lesser extent, architects) are especially important in the hazard mitigation process. Both the public and private sectors place great reliance on their expertise to make the built environment as safe as possible. With respect to natural hazards, structural solutions to limit the impact of a disaster agent have been the primary mitigation emphasis--for example, constructing earthquake-resistant structures and building dams to reduce flood potential. With respect to technological hazards, engineers are asked to design structures with multiple fail-safe mechanisms to protect the public from releases of noxious elements into the environment--for example, petrochemical plants and nuclear facilities.

As stakeholders, then, they have specific vested interests in the outcomes of more formalized liability decisions as well as in the more informal community perspectives that emerge to define their moral and ethical liability for disaster losses. However, stakeholder groups are likely to differ from the public in their collective beliefs about their own and others' responsibility for disasters. These beliefs derive from their professional socialization, their specialized knowledge and expertise, their positions in a market economy, and their existing standards of practice and ethical codes of conduct. Their beliefs may also originate from a distinctive set of social and political values.

In her discussion of professional ethics, Johnson (1991) argues that engineering must be seen as a system that both encourages and constrains the behavior of practicing engineers. Engineers' behavior is related to their engineering education (their professional socialization), the stances of their professional societies (their interest groups), the corporate culture within which they operate (which emphasizes profitability and competition), and the legal rules that affect their liability. Ladd (1991) points out that this system places engineers in an ethical dilemma, as the social expectations associated with professional ideals to work on behalf of public safety and welfare must be balanced against their professional obligations to clients to develop cost-effective projects. Ladd argues that this emphasis on satisfying a client, within the competitive arena of a market economy, often results in decisions that favor the client at the expense of public welfare.

Ladd's assessment was supported in a recent study of engineers and their willingness to use recommended seismic design provisions in their practice. Nigg and her colleagues (1992) found that while most engineers acknowledged the existence of seismic hazard in their communities and concurred that the recommended, enhanced seismic provisions would decrease structural losses and deaths, they did not believe that engineers in their communities would use these new provisions unless they were incorporated into the building code because their use would increase costs and put their firms in a non-competitive position.

METHODOLOGY

These ethical conflicts raise the question of how engineers resolve competing professional goals and what types of situational factors influence their design decisions. In order to begin to investigate how engineers consider issues of responsibility for disaster mitigation and losses, we conducted a small pilot study with practicing engineers who had an interest in seismic design.

In May, 1993, a national earthquake conference was held in Memphis, Tennessee on earthquake hazard reduction needs in the Central and Eastern United States. Since one of the Co-Principal Investigators (Nigg) and a graduate student funded by the research project (D'Souza) planned to attend this conference, we decided to use the occasion to conduct a series of focus group interviews with engineer attendees.

Two months before the conference, the Principal Investigators acquired a list of all pre-registrants for the conference. Using this listing as a first-stage sampling frame, the investigators then identified the registrants who were engineers. From this greatly reduced list[1], 43 pre-registered engineers were stratified by employment sector (public or private) and region of the country in which they worked (Pacific Coast states, Rocky Mountain states, Central states, and balance of the United States).

Calls were made to all of these 43 engineers to tell them about the proposed focus group activity and to enlist their participation. Over 30 of the engineers verbally agreed to participate. A total of 18 actually participated in one of the three scheduled focus groups. We obtained complete questionnaire data from 13 of the engineers.

Although the number of participants was small, we were successful in obtaining a group of engineers who had substantial knowledge and experience in engineering design. As a group, the engineers were highly experienced, with an average of 20 years of practice, and a range of 3 to 32 years. Most (92%) are civil/structural engineers. Three-quarters (77%) are currently

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[1] Although the conference dealt with engineering issues, its organizers had gone to great lengths to ensure that the conference was multi-disciplinary and addressed "earthquake hazard reduction" in the broadest sense.

involved in design work, with about half saying they have "a great deal" of design experience.

The focus group activity took two forms. First, prior to the group discussion, participants were given the questionnaire used in Experiment 2 for the Earthquake-Severe Consequences condition and asked to respond to all of the questions individually. This technique was employed for two reasons: to obtain comparative data; and to stimulate the engineers' thinking about disaster responsibility issues.

Once the questionnaires had been completed and collected, the Co-Principal Investigator of the project acted as facilitator to lead the group discussion for approximately 1 1/2 hours. These discussions were taperecorded and transcribed.

The purpose of the discussion, as was explained to the participating engineers, was to use the scenario as a vehicle to begin to explore how engineers defined the legal, moral, and ethical responsibilities with respect to various disaster consequences. Another issue raised was the relationship between design practice and the extent of scientific knowledge about the likelihood of earthquakes. The discussion also explored the way in which engineers conveyed concepts of safety and responsibility to their clients, and how the engineer and the client reached decisions about safety and cost issues in design.

ENGINEERS' RESPONSES TO THE EARTHQUAKE SCENARIO

The engineers reported that they found the scenario depicting a severe earthquake and its consequences to be quite believable. We undertook exploratory analyses of the responses of the 13 engineers to the scenario items, comparing them to the student respondents in the same condition of Study 2. We were hampered in our statistical analyses by the small sample of engineers (there were 13 engineers and 41 students in most analyses), but nevertheless several interesting patterns emerged.

One difference is that, compared to the engineers, the lay sample had significantly more trust in public agencies to respond to a disaster, and attributed higher levels of responsibility for disaster mitigation and relief to government, especially local government. When asked about the amount of trust that the respondents had in the disaster response of local agencies, the mean for lay respondents was 6.0, compared to 4.6 for the engineers ($t = -2.68$, $p < .01$).

The two groups also differ on the rated importance of different actions that could be taken to mitigate disasters. Table 5.1 displays a variety of disaster mitigation activities and their ratings of importance by the engineers and the students. Engineers think it is more important to conduct a community vulnerability assessment ($t = 2.40$, $p < .05$), to build new earthquake-resistant structures ($t = 2.89$, $p < .01$), to enforce building codes and land use regulations ($t = 2.13$, $p < .05$), and to educate the community ($t = 1.94$, $p = .057$). In contrast, the student sample is significantly more keen on developing a warning system for earthquakes ($t = -3.13$, $p < .01$). We presume that at least some of

TABLE 5.1

RATED IMPORTANCE OF DISASTER MITIGATION ACTIVITIES (Q8)[1]

ACTIVITY	STUDENTS	ENGINEERS
Scientific Assessment of Earthquake Likelihood	7.6	7.8
Structural Vulnerability Assessment[2]	8.1	9.2
Build New Earthquake-Resistant Structures[2]	8.6	9.7
Strengthen Existing Buildings	8.4	8.5
Educate Community[2]	9.0	9.7
Strengthen Building Codes and Land Use Regulations[2]	8.2	9.2
Develop Warning System[2]	8.3	5.9
Purchase Earthquake Insurance	7.9	7.0

[1]Entries in the two columns represent the means for each group. Scale: 1 = low importance; 10 = high importance.

[2]Significant difference between students and engineers, $p < .05$.

these differences may be accounted for by the engineers' greater knowledge of and experience with disaster mitigation techniques.

Comparisons of responsibility judgments showed some differences between engineers and lay respondents. On several items, the student respondents held government to a higher level of responsibility. Table 5.2 shows the differing views of engineers and students about the groups responsible for developing an earthquake warning system. For four of the eight potential groups, the engineers' judgments were significantly different from those of the students. Students were more likely to see the development of a warning system as the responsibility of the government, particularly the local government. Engineers, on the other hand, perceived scientists to have the prime responsibility for developing a warning system. It is also interesting that students were much more likely than engineers to attribute responsibility to the community residents for developing a warning system.

It might be expected that engineers would have a very distinctive set of ideas about the responsibility of their own profession for disaster losses. However, at least in this pilot study, no strong differences between engineers and students were discovered. Considering the eight possible disaster mitigation activities, just one produced a significant difference between engineers and students: Engineers rated the responsibility of architects and engineers to design and build new earthquake-resistant structures more highly than did students ($\underline{M}$ for engineers = 9.9, $\underline{M}$ for students = 9.4, $\underline{p}$ = .01). Even though the students'

TABLE 5.2

PERCEPTIONS OF GROUP RESPONSIBILITY FOR DEVELOPING A WARNING SYSTEM (Q9G)[1]

GROUP	STUDENTS	ENGINEERS
Federal Government	6.2	5.8
State Government	7.9	6.6
Local Government[2]	8.9	5.9
Scientists	6.4	7.9
Architects/Engineers[2]	4.1	3.8
Builders/Contractors[2]	3.9	2.3
Business Owners	4.5	3.1
Community Residents[2]	6.5	3.2

[1]Entries are the means for judgments of responsibility for each group. Scale: 1 = low responsibility; 10 = high responsibility.

[2]Significant difference between students and engineers, $p < .05$.

mean response was lower, both engineers and students rated architects and engineers as the most responsible of all potential parties for designing and building earthquake-resistant structures.

In addition, there was no consistent pattern in the judgments of the responsibility of architects and engineers for various mitigation activities. Comparing the mean responses of students and engineers (without regard to the statistical significance of the comparisons), engineers perceived the responsibility of architects and engineers as somewhat higher in four of the eight mitigation activities and somewhat lower in the other four. It is possible that even these differences can be best explained by the two groups' differential ratings of importance of the specific activities, rather than their distinctive notions of who is responsible.

Analysis of the post-disaster responsibility questions showed some hints that a larger-scale comparison between lay and expert respondents would be valuable. Table 5.3 shows how engineers and students rated the responsibility of various groups for providing compensation for deaths and injuries resulting from the severe earthquake. Once again, students were much more likely to see the government as responsible. Summing across the mean responsibility levels for all three levels of government, we find that students' overall attribution of responsibility for government is 20 (out of a possible 30), compared to 13.5 for engineers.

Engineers were generally more likely than the lay sample to hold private enterprise, including business owners, to higher

TABLE 5.3

PERCEPTIONS OF GROUP RESPONSIBILITY FOR PROVIDING COMPENSATION FOR DEATHS AND INJURIES (Q11A)[1]

GROUP	STUDENTS	ENGINEERS
Federal Government	5.9	3.9
State Government	7.0	4.2
Local Government	7.1	5.4
Scientists	2.7	2.6
Architects/Engineers	3.6	3.9
Builders/Contractors	3.8	3.5
Local Businesses	3.1	4.1
Community Residents	2.8	3.5

[1]Entries in the two columns represent the mean response for each group. Scale: 1 = low responsibility; 10 = high responsibility.

[2]Significant difference between students and engineers, $p < .05$.

levels of responsibility for disaster relief. Compared to students, engineers saw business owners as significantly more responsible for the restoration of rental housing (M = 7.3 for engineers; M = 4.7 for students; p = .03) and more responsible for debris removal (M = 7.4 for engineers; M = 5.4 for students; p = .04). In other types of post-disaster relief, although the differences were not statistically significant, in every instance the engineers' attributions of business responsibility were either the same or higher than the students' attributions of business responsibility.

Respondents had the opportunity to make judgments about "architects and engineers" as one of the groups potentially responsible for disaster cleanup and compensation. Attributed responsibility for disaster losses for these design professionals was generally quite low (all means were 5.1 or lower) and did not differ for students and engineers.

In sum, we found a good deal of overlap between engineers and students in their responsibility judgments for disaster mitigation and compensation, but some important differences emerged in the extent to which government and business were seen as responsible.

FOCUS GROUP DISCUSSIONS

The focus group discussions provide some fascinating glimpses into the ethical and moral dilemmas that engineers face in their work.

One important initial observation that several engineers made is that the public is not very knowledgeable about their specialty. In response to a question asking whether the public expects more of engineers and design professionals now than in the past, one group discussion emphasized the public's lack of information about the profession and how that might affect perceptions of responsibility:

> A3: I think the engineering and design features of our economy are basically hidden from the public. I don't think that a lot of the public realize the architectural and engineering business, what they should expect of them, or what they even do.
>
> A4: Because all they're looking at is the finished product....
>
> A1: The public is totally uneducated. It's our fault when we're not telling the public what we do....
>
> A1: They always hear the failures, you know. Engineers aren't out there enough blowing their own horns on how great it is that all these buildings are standing up.
>
> [Group 1]

This lack of basic knowledge can affect how the public views the responsibilities of the engineering profession, perhaps leading to unrealistic expectations about engineering practices.

As for the engineers' own views about responsibility, one overarching issue is the strong link evident in the engineers' minds between what is considered to be ethical and moral, and what is "legal." Indeed, when engineers were asked to discuss responsibility for designing buildings, they frequently referred to the legal responsibilities they had to design buildings in accordance with existing building codes.

One engineer described the balancing act that occurs in the development of building codes, as competing interests are weighed:

> Well, I think that the way codes develop is that the people concerned about these matters get together and...you've got technical input, you've got risk input, you've got input on what's it going to cost and you try to come up with a reasonable balance of high standards and reasonable cost....[T]he code doesn't say build a safe building, it says meet these standards....There's always the possibility of setting the standards higher but we draw the line someplace. [A2, Group 3]

Applying the code to the design of a specific building often raises ethical dilemmas. Engineers were asked about what they would do if they felt that the code was insufficient for a particular building. Several engineers discussed an apparently common problem of working for a client who is very concerned about the bottom line and who does not want to go beyond the bare minimum specified by building codes. Engineers described the efforts that they engage in to educate the client about potential problems that could be avoided if "designing above the code" was followed. One engineer said:

> I think that's implied or actually explicitly stated in your engineering registration that you shall protect the public....The code is merely just a minimum, kind of a compendium of things that have gone wrong in the past. If you know something new that's going to happen in the

future, then you're, as an engineer, obligated to design that into your structure. [A1, Group 2]

But another engineer argued:

> If the cost factor comes into play, you have an obligation to at least point it out to the owner. Now he can get you off the hook if he doesn't want to do it. You obviously work for him....If he insists not doing it, he takes over the responsibility and liability for it. [A7, Group 2]

As one engineer observed:

> It's going to be harder to design greater than the code because the owner's looking at dollars. How much is it going to cost him per square foot. He has to go to code, but to go beyond that, it's going to be very difficult to convince him. [A2, Group 1]

Another similarly pointed out:

> You cannot force him to spend the money because you work for him. He's your client, so...he calls the shots on how much money he wants to spend and if he sets that limitation, that becomes a question: How can you force him to do otherwise? Because it's his money and he makes that decision except that since you are part of the whole discussion and cognizant of the problem or the shortcomings, why, you become responsible. [A1, Group 2]

Another issue that was explored was how changes in the code, or design practices that exceeded the code, came about. A hypothetical was posed to one group: What if new scientific information became available that suggested greater earthquake risk in a community? How would that be taken into account? One engineer speculated:

> ...if scientists made that kind of report and it became known locally, I'd expect that engineers that became aware of it should say, we should be doing something about this...let's get something before city council on this. I would expect that there would be broad difference of opinion. I can imagine some engineers saying, well, that's hogwash, we don't need to be worried about that, others saying, we've really got to do something. There'd be a difference of opinion and it wouldn't be an easy decision because raising the standards raises the cost to the community and business people, if their business is marginal and they've got to put another $10 a square foot into their building to upgrade it to meet a higher code and they don't have the income to cover it, why, there'd be some resistance there. But it would finally be a community decision....hopefully, the push for a higher standard will prevail, but whatever the final decision is, it is a community decision that should come out of a democratic process of making the choice. [A1, Group 3]

Engineers talked about other ways in which the code, or design practices, could change over time. Disaster events may occur that alert the community to the need for higher standards:

> When people are exposed to more frequent seismic events there's a lot higher conscious level about the potential disasters and the necessity of proper design whereas in areas where occurrences are very infrequent, the whole awareness in the public and maybe in some circles of professionals is very low. [A2, Group 2]

Larger cities, especially those with a high frequency of earthquakes, were seen as leading the industry toward higher design standards.

In addition, new scientific research findings may be disseminated to elite engineering firms, producing differences in design practice. One engineer observed that firms can differ substantially in their level of design:

> A quality firm may have a standard of care just a few years ahead of the code. [A5, Group 2]

Finally, although clients were usually seen as frustrating the engineer's efforts to enhance design safety, at least one example was offered in which the client's actions improved the design standard:

> We have a lot of poultry houses in [our state] and everytime we have a 15 or 20 inch snowfall which happens occasionally, we have a lot of poultry houses that end up on the ground. About 20 years ago, shortly after I started in practice, a fabricator and contractor who fabricates and erects poultry houses asked me to help him evaluate his product line and in so doing I [concluded

> the loading criteria recommended by the American Society of Agricultural Engineers was more appropriate for his product line.] The money was more but it was not enough more that it was going to...so that farmers could still buy it. So my client who was the major constructor of these kind of buildings adopted those as design criteria, so all subsequent poultry houses that he put out on the market were designed according to that....That has now become what people who buy chicken houses in [our state] expect....[T]he catalyst for making that change was the client being willing to pay me to evaluate it and see if there's something he can do that would be better. [A1, Group 2]

Engineers also discussed how the concern about potential liability affects their work lives. They were very conscious of the possibility of being sued. In considering ethical questions they often brought up the likelihood of being sued, which they perceived as substantial.

> With all the litigation and the tremendous number of attorneys looking with the attitude that everything that happens is somebody else's fault and therefore there's some money to be made on it, I think we're going to definitely going to be getting into that consistently more until, I don't know where it's gonna go. [A3, Group 1]

Interestingly, the engineers' comments about the litigation explosion and its negative impact on business are quite similar to the concerns expressed by the general public (Hans and Lofquist, 1993; 1994).

DISCUSSION

The use of a hypothetical earthquake scenario appeared to be a good vehicle for stimulating discussion among engineers about responsibility for disasters. It also allowed us to compare how engineers and a lay sample evaluated the same disaster and its consequences. There was a good deal of similarity in the responses of the two samples, but some interesting differences that merit further study. The ways in which threats of liability and the existence of codes affect engineers' reasoning about their own moral responsibilities, and their interactions with clients over cost control and design, are intriguing and deserve greater attention and analysis. In general, the pilot data support the observations of Ladd (1991) and Nigg et al. (1992) about the inevitable moral conflicts between engineers and their clients surrounding design safety. In future work, we may want to expand the scenario to include client-engineer disagreements about the appropriate level of design safety and the desirability of designing above the code, and observe how both engineers and the lay public respond to such disagreements.

CHAPTER 6

BRIEF SUMMARY OF FINDINGS

Scientific advances in identifying, predicting and mitigating hazards are likely to produce significant changes in how the public assesses responsibility for reducing disaster losses. However, disaster and hazards research has given little attention to the issue of legal liability, much less to questions of attribution of moral and ethical responsibility. This project undertook an integrated series of experimental and pilot studies to examine the factors that influence judgments of responsibility for mitigation and compensation for losses from both technological and natural disasters.

Three experimental studies were conducted using college students to determine the effects that the type of disaster agent (technological or natural) and magnitude of consequences (severe and moderate) would have on attributions of responsibility for disaster losses. In addition, a pilot study was conducted with practicing engineers to determine the extent to which this group of stakeholders perceived responsibility in a manner that was similar to or different from lay subjects. We also explored in focus group discussions the ethical and moral dilemmas that engineers face in their worklife.

The scenario experiments yielded some interesting data on the factors that influence responsibility judgments in disaster contexts. In the first two experiments, although we made strenuous efforts to describe comparable natural and technological disasters, people differentiated between them. Before learning about the actual impact of the different disasters, the respondents rated the technological disaster as producing more severe consequences than the natural disaster. They expressed more worry about the technological disaster. In Experiment 1, even after learning that the impact of natural and technological disasters was approximately the same, the technological nature of a disaster influenced the subjects' judgments of responsibility for disaster losses, with greater responsibility attributed to the plant owners, local officials, and even scientists for technological disaster losses. This differentiation of natural and technological disasters is quite consistent with prior research literature showing the distinctive reactions people have to technological hazards. However, Experiment 3 shows that it is possible to equate and control the nature of technological disasters so that they are perceived essentially the same as natural disasters.

Although we were successful in describing disasters of different severity, the variation of a disaster's severity had only modest effects on responsibility judgments. Intuition, and some research, suggests that more severe disasters may create greater demand for accountability. No such pattern was found in the current study. Indeed, in several instances, judgments of responsibility went the opposite direction. For example, scientists were held more responsible for moderate earthquakes than for severe ones. (Judgments of responsibility for technological disasters, it should be recalled, did not follow this pattern.) Even though we presented the same information about the low predictability of the event in the Moderate Disaster and Severe Disaster conditions, subjects may have believed that more moderate natural disasters were to be anticipated and that it is the responsibility of scientists and others to be prepared for moderate natural disasters. Severe natural disasters, in contrast, may have been viewed as so unusual and extreme that they could not be prepared for--almost like an Act of God rather than an event whose consequences could be mitigated by human action. Another factor to consider is that even our moderate event was quite severe. The degree of a disaster's severity might play a role in responsibility judgments at lower levels, but once it reaches a certain threshold it may no longer affect attributions of responsibility. In subsequent research we will have to explore this possibility.

Throughout their responses, subjects reflected the strong desire to control the likelihood and impact of disasters. Even for the natural disaster, attributed responsibility was substantial. Especially notable was the high responsibility attributed to local, state, and federal governments for both disaster mitigation and post-disaster relief and compensation. The chemical spill was caused by a private, for-profit business, yet all three levels of government were expected to undertake activities to lessen the damages of such spills in advance, and to compensate and help those who were injured as a result of the spill.

As a general rule, local government was seen as most responsible for mitigation and post-disaster assistance, federal government was viewed as least responsible, and state government was in the middle. This was the case even for very severe disasters, when one might expect greater contributions from federal and state governments. We suggest that the judgment that local government is most responsible reflect our respondents' sense that, whatever the financial realities, local government has the moral imperative to provide guidance in rebuilding the local community after a disaster, no matter what its severity.

Judgments of responsibility for the professional groups varied across specific types of disaster-related activity. As we described earlier, for all three groups of professionals, scientists, architects and engineers, and builders and contractors, there was a fairly high amount of responsibility attributed for disaster mitigation. The professional groups were seen as culpable for lessening the likelihood and impact of disasters. Except for the scientists, who were held to a higher standard of responsibility for technological spills, the professionals' responsibility for helping the community to rebuild after a disaster was judged to be only moderate.

The comparative data from engineers show that, like risk perception, lay and expert judgments of responsibility are likely to differ in significant ways. The focus group discussions of the ethical and moral dilemmas in engineering indicate that engineers consider law as they attempt to mediate between design considerations and financial constraints. The manner in which legal requirements influence and perhaps even limit ethical decision making by professionals in the disaster context is of enormous interest and deserves further analysis.

These early studies provide evidence that a systematic approach to examining judgments of responsibility for disasters can be quite informative. In future work we hope to expand the populations we study to include members of the general public and a wider array of professionals involved in disaster planning and relief efforts. We are also interested in discovering how other aspects of disasters, especially the predictability and controllability of the agent and its consequences, affect judgments of responsibility, and are developing new variations of scenario components for testing. Finally, we plan to complement these experimental studies with further exploration of how professionals resolve real-world ethical dilemmas in the disaster context.

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APPENDIX 1

EXPERIMENT 1

SCENARIO: NATURAL DISASTER--MODERATE CONSEQUENCES

UNIVERSITY OF DELAWARE COMMUNITY PERCEPTION STUDY

CERTIFICATE OF INFORMED CONSENT

The purpose and nature of this study has been explained to me. I understand that I will be reading a description of a community and events that take place in it and making some individual judgments about those happenings.

I understand that my participation in this study will have no bearing on my grade in this course, except that I will receive 5 points extra credit for my participation.

I have been informed that all of my responses will remain confidential and that my participation in this study will be anonymous.

I voluntarily agree to participate in this research project.

NAME: (PLEASE PRINT) ______________________________

SIGNATURE: ______________________________

ID #: ______________________

DATE: ______________________

DESCRIPTION OF SANTA LOUISA

The city of Santa Louisa is an older, but growing community located about 5 miles inland on California's central coast, midway between Santa Cruz to the north and Santa Barbara to the south. The city was originally established as one of California's early missions by Father Junipero Serra in 1712, and lies at the bottom of a small, lush valley. The community remained a small farming community until the early 1920's when vacationers along the nearby coast started moving to the area for its small town way of life and healthy climate.

The city was finally incorporated in 1930 and established its first city government. The city center quickly expanded around the old mission district to about eight square blocks with 2 to 6 story buildings constituting the downtown area.

Following World War II, the community became a desirable place to build new light industry because there was sufficient available land around the city center to build the new facilities that would house these modern technologies. As a result, many people moved into the area during the 1950's and 1960's to take jobs in these new plants. As a result, several new housing developments sprang up around the city center.

One of Santa Louisa's main industries remains farming; the area around the city is particularly well-known for its peaches and nectarines. In the hills around Santa Louisa, many well-established vineyards are located. The Santa Susana Valley is second only to the Napa Valley in producing exceptional California wines.

Due to the growing population in this general area of the California coast during the 1960's, the California State University system established a new campus in Santa Louisa in 1969 on the outskirts of the residential areas. The campus was primarily for undergraduate liberal arts and business majors. However, a new prestigious College of Architecture was established to draw both undergraduates and graduate students from throughout the state to this campus.

In the 1970's, the state's Department of Corrections built a medium security prison in the countryside around Santa Louisa. The prison population, now numbering around 4,000, works by farming the 400 acres around the prison.

Today, the central business district in the downtown area consists of local and county government office buildings (Santa Louisa is also the county seat of Santa Susana County), established retail stores, professional office buildings (for doctors, lawyers, and accountants), and many service businesses. While many buildings are modern--having been built since the 1960's--there are also many older and historical structures in the downtown area that date to the mid-1800's. The housing developments surrounding the city center are now "mature" areas with established schools, stores, and small shopping centers. Newer more expensive residential developments are still being built farther from the city center. Interspersed between these residential areas are the manufacturing and high tech plants and business parks that employ many of the city's residents. The population in the 1990 census was 98,765. The University student population adds another 7,500 people who are in the community for at least 9 months each year.

In general, the community has retained its reputation for being a "nice place to live" with its low rate of unemployment, expanding high tech industries, good climate, and clean environment.

INSTRUCTIONS: ANSWER THE FOLLOWING QUESTIONS <u>BEFORE</u> CONTINUING ON TO THE NEXT SECTION.

1. From what you now know about Santa Louisa, how would you assess the quality of life its residents experience? Please circle the number in the following scale that best represents your assessment--a "1" means a very poor quality of life and a "10" means a wonderful quality of life.

VERY POOR									WONDERFUL
1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

2. If you were a resident of Santa Louisa, how desirable do you think it would be to make this community your home? Would it be very desirable, somewhat desirable, somewhat undesirable, or very undesirable?

( ) VERY DESIRABLE
( ) SOMEWHAT DESIRABLE
( ) SOMEWHAT UNDESIRABLE
( ) VERY UNDESIRABLE

Briefly, please explain your answer.

____

____

____

____

3. From what you now know about Santa Louisa, how likely do you think it is that the following events could occur in this community? Please circle the number in the following scale that best represents your assessment--a "1" means the event is not at all likely; a "10" that it is very likely.

		NOT AT ALL LIKELY									VERY LIKELY
		1	2	3	4	5	6	7	8	9	10
A.	High levels of unemployment?	1	2	3	4	5	6	7	8	9	10
B.	A severe flood?	1	2	3	4	5	6	7	8	9	10
C.	A prison riot?	1	2	3	4	5	6	7	8	9	10
D.	High levels of air pollution?	1	2	3	4	5	6	7	8	9	10
E.	A destructive earthquake?	1	2	3	4	5	6	7	8	9	10
F.	A hazardous chemical release from a manufacturing plant?	1	2	3	4	5	6	7	8	9	10
G.	A student demonstration?	1	2	3	4	5	6	7	8	9	10

MORE ABOUT SANTA LOUISA

The community of Santa Louisa had experienced several small earthquakes--that mostly just gently shook the city's inhabitants--over the past 20 years or so. Being in California's "earthquake belt," of course, meant that residents knew what consequences earthquakes had for other nearby small communities as well as for the larger urban areas in the state. For example, the Loma Prieta earthquake in October, 1989 killed 104 people, injured 3,400 others, caused the collapse of an elevated freeway, largely destroyed Santa Cruz's downtown district, and damaged many multi-storied buildings in the San Francisco Bay Area.

While the majority of residents knew that the Los Osos Fault existed near the city, it had never caused much concern among community residents for their safety.

City agencies (particularly the Police Department, the Fire Department, and the Emergency Management Office) have done some disaster response planning, covering a wide range of disasters that could happen in the city. This will enable them to work more effectively to lessen life loss if a disaster occurs in the city. However, city officials have not undertaken any actions that would improve the safety or safe operation of any of the buildings or facilities in the city, mainly because the city lacks the money to do so.

INSTRUCTIONS: ANSWER THE FOLLOWING QUESTIONS <u>BEFORE</u> CONTINUING ON TO THE NEXT SECTION.

4. Given their experience with earthquakes, do you think the residents of Santa Louisa should be more concerned about their safety, less concerned, or do they have the right amount of concern?

   ( ) MORE CONCERNED
   ( ) LESS CONCERNED
   ( ) ABOUT RIGHT

5. And what about the public officials? Do you think they should be more concerned about the safety of the city's buildings and facilities, less concerned, or do they have the right amount of concern?

( ) MORE CONCERNED
( ) LESS CONCERNED
( ) ABOUT RIGHT

6. If you were a resident of Santa Louisa, how concerned would **you** be about your safety because of the existence of the earthquake fault? Would you be more concerned than everyone else, less concerned, or have a similar amount of concern?

( ) MORE CONCERNED
( ) LESS CONCERNED
( ) ABOUT THE SAME

7. Do you think that residents of Santa Louisa should take action to prepare themselves and their families to deal with an earthquake? Given the history in Santa Louisa, but also what they know has happened elsewhere, should Santa Louisa's residents take a lot of action, take some action, take a few actions, or take no action?

( ) TAKE A LOT OF ACTION
( ) TAKE SOME ACTION
( ) TAKE A FEW ACTIONS
( ) TAKE NO ACTION

8. How much trust would you put in local agencies to be able to respond to a large earthquake that affected Santa Louisa? Would you say you would have a great deal of trust, some trust, not much trust, or no trust at all in their ability to respond to such an event?

( ) GREAT DEAL OF TRUST
( ) SOME TRUST
( ) NOT MUCH TRUST
( ) NO TRUST AT ALL

9. From what you now know about Santa Louisa, how would you assess the quality of life of its residents?

VERY POOR									WONDERFUL
1	2	3	4	5	6	7	8	9	10

AN EVENT IN SANTA LOUISA

At 10:05 on a Wednesday morning in November, 1992, a 5.2 earthquake rocked the city of Santa Louisa and its surrounding suburbs. The earthquake resulted from the movement on a known fault--the Los Osos Fault--that had not been active recently. The fault is about 3 miles from the city center, just beyond the city limits.

The initial earthquake shock shook the ground for only about 8 seconds, a relatively short time for an earthquake in this area.

Because the soils underneath the city are uncompacted alluvial sediments, the earthquake caused all areas of the city to experience some shaking. The damages and losses from the earthquake occurred throughout the city--in its downtown center as well as its surrounding residential and business park areas. However, few other nearby communities sustained any damage or losses from this earthquake event.

INSTRUCTIONS: ANSWER THE FOLLOWING QUESTIONS <u>BEFORE</u> CONTINUING ON TO THE NEXT SECTION.

10. Given what you know about the physical nature of this earthquake, how severe do you think the consequences of it will be for the community? Do you think they will be very severe, somewhat severe, not too severe, or not severe at all?

    ( ) VERY SEVERE
    ( ) SOMEWHAT SEVERE
    ( ) NOT TOO SEVERE
    ( ) NOT SEVERE AT ALL

11. How many people do you think could be <u>killed</u> by such an event --none, less than 100, more than 100 but less than 1000, more than 1000?

    ( ) NONE
    ( ) LESS THAN 100
    ( ) MORE THAN 100, BUT LESS THAN 1000
    ( ) MORE THAN 1000 (How many? ________________)

GO RIGHT ON TO THE NEXT PAGE.

12. How many people do you think could be <u>injured</u> by such an event--none, less than 100, more than 100 but less than 1000, more than 1000?

( ) NONE
( ) LESS THAN 100
( ) MORE THAN 100, BUT LESS THAN 1000
( ) MORE THAN 1000 (How many? ________________)

13. What percent of the community's <u>commercial structures</u>--businesses, office buildings, manufacturing plants--do you think would be destroyed or severely damaged by such an event?

( ) NONE

____________%

14. What percent of the community's <u>residential dwellings</u>--single family homes, apartment houses, condominiums--do you think would be destroyed or severely damaged by such an event?

( ) NONE

____________%

15. Given that this event has occurred, what consequences do you think it will have for the residents of Santa Louisa; that is, how much will it interfere with their daily lives? Do you think it will be very disruptive, somewhat disruptive, not too disruptive, or not disruptive at all?

( ) VERY DISRUPTIVE
( ) SOMEWHAT DISRUPTIVE
( ) NOT TOO DISRUPTIVE
( ) NOT DISRUPTIVE AT ALL

16. If you were living in Santa Louisa at the time that this event occurred, how concerned do you think you would be for your personal safety? Would you be very concerned, somewhat concerned, not too concerned, or not concerned at all?

( ) VERY CONCERNED
( ) SOMEWHAT CONCERNED
( ) NOT TOO CONCERNED
( ) NOT CONCERNED AT ALL

CONTINUE READING THE NEXT SECTION.

MORE ABOUT THE EARTHQUAKE

The earthquake was not predicted. Scientists had previously mapped the fault and determined that it was "active" (in geologic terms, which means that the fault has moved within the last 7,000 years). It was believed that an earthquake of this magnitude was very unlikely in the near future. Scientists know, however, that an earthquake can occur at any time on an active fault.

Because the event was not predicted, residents of the area had no warning that an event was imminent or even very likely to occur. Scientists were, in fact, surprised that the fault was capable of producing an earthquake of this magnitude.

INSTRUCTIONS: ANSWER THE FOLLOWING QUESTIONS <u>BEFORE</u> CONTINUING ON TO THE NEXT SECTION.

17. Even though scientists believed that an earthquake of this magnitude was unlikely to occur, should the scientists have done more research to know more about the earthquake possibilities? Should they have done a lot more research, some research, a little bit more research, or no more research?

    ( ) A LOT MORE RESEARCH
    ( ) SOME RESEARCH
    ( ) A LITTLE BIT MORE RESEARCH
    ( ) NO MORE RESEARCH

18. Although this event was believed to be very unlikely, should local officials, working with the scientists, have tried to develop a warning system, even if it might only give a few seconds of warning to the community's residents?

    ( ) DEFINITELY
    ( ) PROBABLY
    ( ) PROBABLY NOT
    ( ) DEFINITELY NOT

GO RIGHT ON TO THE NEXT PAGE.

19. Whose responsibility is it to get such a warning system developed? Please circle the number that best reflects your beliefs about each of the following--a "1" indicates no responsibility; a "10" means high responsibility.

		NO RESP.									HIGH RESP.
		1	2	3	4	5	6	7	8	9	10
A.	Scientists?	1	2	3	4	5	6	7	8	9	10
B.	Local officials?	1	2	3	4	5	6	7	8	9	10
C.	Building owners?	1	2	3	4	5	6	7	8	9	10
D.	Community residents?	1	2	3	4	5	6	7	8	9	10

NOW, CONTINUE ON TO THE NEXT SECTION .

MORE ABOUT THE EARTHQUAKE

The earthquake caused 9 deaths, 78 injuries that needed medical treatment, and hundreds of other minor injuries. Almost 200 families (about 1,000 people) evacuated their homes for several hours to several days until they could be assured that their homes were safe.

This was an expensive earthquake in terms of economic losses. It was estimated that damage to structures would cost almost $100 million to repair. Economic losses to businesses--due to damage to their buildings, loss of utilities, loss of production and office equipment, loss of customers, and loss of inventories and stock--would be about $200 million during the 24 months following the earthquake.

City officials estimated that it would take Santa Louisa at least two years to recover from this earthquake.

INSTRUCTIONS: ANSWER THE FOLLOWING QUESTIONS <u>BEFORE</u> CONTINUING ON TO THE NEXT SECTION.

20. Given what you now know about the physical nature of this earthquake, how severe do you think the consequences of it were for the community? Do you think they were very severe, somewhat severe, not too severe, or not severe at all?

    ( ) VERY SEVERE
    ( ) SOMEWHAT SEVERE
    ( ) NOT TOO SEVERE
    ( ) NOT SEVERE AT ALL

21. How responsible are the scientists for the damages and losses that occurred due to the earthquake? Are they very responsible, responsible, not too responsible, or not responsible at all?

    ( ) VERY RESPONSIBLE
    ( ) RESPONSIBLE
    ( ) NOT TOO RESPONSIBLE
    ( ) NOT RESPONSIBLE AT ALL

GO RIGHT ON TO THE NEXT PAGE.

22. How responsible are the local officials for the damages and losses that occurred? Were they very responsible, responsible, not too responsible, or not responsible at all?

( ) VERY RESPONSIBLE
( ) RESPONSIBLE
( ) NOT TOO RESPONSIBLE
( ) NOT RESPONSIBLE AT ALL

23. How responsible are the owners of the damaged buildings for the losses that occurred? Were they very responsible, responsible, not too responsible, or not responsible at all?

( ) VERY RESPONSIBLE
( ) RESPONSIBLE
( ) NOT TOO RESPONSIBLE
( ) NOT RESPONSIBLE AT ALL

24. Since they weren't concerned about the possibility of a destructive earthquake happening, how responsible were local residents for the damages and losses that occurred?

( ) VERY RESPONSIBLE
( ) RESPONSIBLE
( ) NOT TOO RESPONSIBLE
( ) NOT RESPONSIBLE AT ALL

C

APPENDIX 1

EXPERIMENT 1

SCENARIO: TECHNOLOGICAL DISASTER--MODERATE CONSEQUENCES

UNIVERSITY OF DELAWARE COMMUNITY PERCEPTION STUDY

CERTIFICATE OF INFORMED CONSENT

The purpose and nature of this study has been explained to me. I understand that I will be reading a description of a community and events that take place in it and making some individual judgments about those happenings.

I understand that my participation in this study will have no bearing on my grade in this course.

I have been informed that all of my responses will remain confidential and that my participation in this study will be anonymous.

I voluntarily agree to participate in this research project.

NAME: (PLEASE PRINT) ______________________________

SIGNATURE: ______________________________

DATE: ______________________________

DESCRIPTION OF SANTA LOUISA

The city of Santa Louisa is an older, but growing community located about 5 miles inland on California's central coast, midway between Santa Cruz to the north and Santa Barbara to the south. The city was originally established as one of California's early missions by Father Junipero Serra in 1712, and lies at the bottom of a small, lush valley. The community remained a small farming community until the early 1920's when vacationers along the nearby coast started moving to the area for its small town way of life and healthy climate.

The city was finally incorporated in 1930 and established its first city government. The city center quickly expanded around the old mission district to about eight square blocks with 2 to 6 story buildings constituting the downtown area.

Following World War II, the community became a desirable place to build new light industry because there was sufficient available land around the city center to build the new facilities that would house these modern technologies. As a result, many people moved into the area during the 1950's and 1960's to take jobs in these new plants. As a result, several new housing developments sprang up around the city center.

One of Santa Louisa's main industries remains farming; the area around the city is particularly well-known for its peaches and nectarines. In the hills around Santa Louisa, many well-established vineyards are located. The Santa Susana Valley is second only to the Napa Valley in producing exceptional California wines.

Due to the growing population in this general area of the California coast during the 1960's, the California State University system established a new campus in Santa Louisa in 1969 on the outskirts of the residential areas. The campus was primarily for undergraduate liberal arts and business majors. However, a new prestigious College of Architecture was established to draw both undergraduates and graduate students from throughout the state to this campus.

In the 1970's, the state's Department of Corrections built a medium security prison in the countryside around Santa Louisa. The prison population, now numbering around 4,000, works by farming the 400 acres around the prison.

Today, the central business district in the downtown area consists of local and county government office buildings (Santa Louisa is also the county seat of Santa Susana County), established retail stores, professional office buildings (for doctors, lawyers, and accountants), and many service businesses. While many buildings are modern--having been built since the 1960's--there are also many older and historical structures in the downtown area that date to the mid-1800's. The housing developments surrounding the city center are now "mature" areas with established schools, stores, and small shopping centers. Newer more expensive residential developments are still being built farther from the city center. Interspersed between these residential areas are the manufacturing and high tech plants and business parks that employ many of the city's residents. The population in the 1990 census was 98,765. The University student population adds another 7,500 people who are in the community for at least 9 months each year.

In general, the community has retained its reputation for being a "nice place to live" with its low rate of unemployment, expanding high tech industries, good climate, and clean environment.

INSTRUCTIONS: ANSWER THE FOLLOWING QUESTIONS <u>BEFORE</u> CONTINUING ON TO THE NEXT SECTION.

1. From what you now know about Santa Louisa, how would you assess the quality of life its residents experience? Please circle the number in the following scale that best represents your assessment--a "1" means a very poor quality of life and a "10" means a wonderful quality of life.

VERY POOR ... WONDERFUL

1 2 3 4 5 6 7 8 9 10

GO RIGHT ON TO THE NEXT PAGE.

2. If you were a resident of Santa Louisa, how desirable do you think it would be to make this community your home? Would it be very desirable, somewhat desirable, somewhat undesirable, or very undesirable?

( ) VERY DESIRABLE
( ) SOMEWHAT DESIRABLE
( ) SOMEWHAT UNDESIRABLE
( ) VERY UNDESIRABLE

Briefly, please explain your answer.

____

____

____

____

3. From what you now know about Santa Louisa, how likely do you think it is that the following events could occur in this community? Please circle the number in the following scale that best represents your assessment--a "1" means the event is not at all likely; a "10" that it is very likely.

		NOT AT ALL LIKELY									VERY LIKELY
		1	2	3	4	5	6	7	8	9	10
A.	High levels of unemployment?	1	2	3	4	5	6	7	8	9	10
B.	A severe flood?	1	2	3	4	5	6	7	8	9	10
C.	A prison riot?	1	2	3	4	5	6	7	8	9	10
D.	High levels of air pollution?	1	2	3	4	5	6	7	8	9	10
E.	A destructive earthquake?	1	2	3	4	5	6	7	8	9	10
F.	A hazardous chemical release from a manufacturing plant?	1	2	3	4	5	6	7	8	9	10
G.	A student demonstration?	1	2	3	4	5	6	7	8	9	10

MORE ABOUT SANTA LOUISA

The community of Santa Louisa had experienced several small earthquakes--that mostly just gently shook the city's inhabitants--over the past 20 years or so. Being in California's "earthquake belt," of course, meant that residents knew what consequences earthquakes had for other nearby small communities as well as for the larger urban areas in the state. For example, the Loma Prieta earthquake in October, 1989 killed 104 people, injured 3,400 others, caused the collapse of an elevated freeway, largely destroyed Santa Cruz's downtown district, and damaged many multi-storied buildings in the San Francisco Bay Area.

While the majority of residents knew that the Los Osos Fault existed near the city, it had never caused much concern among community residents for their safety.

City agencies (particularly the Police Department, the Fire Department, and the Emergency Management Office) have done some disaster response planning, covering a wide range of disasters that could happen in the city. This would enable them to work more effectively to lessen life loss if a disaster occurred in the city. However, city officials have not undertaken any actions that would improve the safety or safe operation of any of the buildings or facilities in the city, mainly because the city lacks the money to do so.

INSTRUCTIONS: ANSWER THE FOLLOWING QUESTIONS <u>BEFORE</u> CONTINUING ON TO THE NEXT SECTION.

4. Given their experience with earthquakes, do you think the residents of Santa Louisa should be more concerned about their safety, less concerned, or do they have the right amount of concern?

   ( ) MORE CONCERNED
   ( ) LESS CONCERNED
   ( ) ABOUT RIGHT

GO RIGHT ON TO THE NEXT PAGE.

5. And what about the public officials? Do you think they should be more concerned about the safety of the city's buildings and facilities, less concerned, or do they have the right amount of concern?

( ) MORE CONCERNED
( ) LESS CONCERNED
( ) ABOUT RIGHT

6. If you were a resident of Santa Louisa, how concerned would you be about your safety because of the existence of the earthquake fault? Would you be more concerned than everyone else, less concerned, or have a similar amount of concern?

( ) MORE CONCERNED
( ) LESS CONCERNED
( ) ABOUT THE SAME

7. Do you think that residents of Santa Louisa should take action to prepare themselves and their families to deal with an earthquake? Given the history in Santa Louisa, but also what they know has happened elsewhere, should Santa Louisa's residents take a lot of action, take some action, take a few actions, or take no action?

( ) TAKE A LOT OF ACTION
( ) TAKE SOME ACTION
( ) TAKE A FEW ACTIONS
( ) TAKE NO ACTION

8. How much trust would you put in local agencies to be able to respond to a large earthquake that affected Santa Louisa? Would you say you would have a great deal of trust, some trust, not much trust, or no trust at all in their ability to respond to such an event?

( ) GREAT DEAL OF TRUST
( ) SOME TRUST
( ) NOT MUCH TRUST
( ) NO TRUST AT ALL

9. From what you now know about Santa Louisa, how would you assess the quality of life of its residents?

VERY POOR ... WONDERFUL

1 2 3 4 5 6 7 8 9 10

AN EVENT IN SANTA LOUISA

At 10:05 on a Wednesday morning in November, 1992, a 7.9 earthquake rocked the city of Santa Louisa and its surrounding suburbs. The earthquake resulted from the movement on a known fault--the Los Osos Fault--that had not been active recently. The fault is about 3 miles from the city center, just beyond the city limits.

The initial earthquake shock shook the ground for over 50 seconds, a relatively long time for an earthquake in this area. The earth then continued to vibrate for several minutes following the quake's major shock.

Because the soils underneath the city are uncompacted alluvial sediments, the earthquake caused all areas of the city to experience extreme and prolonged shaking. The damages and losses from the earthquake occurred throughout the city--in its downtown center as well as its surrounding residential and business park areas. However, few other nearby communities sustained any major damage or losses from this earthquake event.

INSTRUCTIONS: ANSWER THE FOLLOWING QUESTIONS <u>BEFORE</u> CONTINUING ON TO THE NEXT SECTION.

10. Given what you know about the physical nature of this earthquake, how severe do you think the consequences of it will be for the community? Do you think they will be very severe, somewhat severe, not too severe, or not severe at all?

    ( ) VERY SEVERE
    ( ) SOMEWHAT SEVERE
    ( ) NOT TOO SEVERE
    ( ) NOT SEVERE AT ALL

GO RIGHT ON TO THE NEXT PAGE.

11. How many people do you think could be killed by such an event --none, less than 100, more than 100 but less than 1000, more than 1000?

( ) NONE
( ) LESS THAN 100
( ) MORE THAN 100, BUT LESS THAN 1000
( ) MORE THAN 1000 (How many? ________________)

12. How many people do you think could be injured by such an event--none, less than 100, more than 100 but less than 1000, more than 1000?

( ) NONE
( ) LESS THAN 100
( ) MORE THAN 100, BUT LESS THAN 1000
( ) MORE THAN 1000 (How many? ________________)

13. What percent of the community's commercial structures--businesses, office buildings, manufacturing plants--do you think would be destroyed or severely damaged by such an event?

( ) NONE

____________%

14. What percent of the community's residential dwellings--single family homes, apartment houses, condominiums--do you think would be destroyed or severely damaged by such an event?

( ) NONE

____________%

15. Given that this event has occurred, what consequences do you think it will have for the residents of Santa Louisa; that is, how much will it interfere with their daily lives? Do you think it will be very disruptive, somewhat disruptive, not too disruptive, or not disruptive at all?

( ) VERY DISRUPTIVE
( ) SOMEWHAT DISRUPTIVE
( ) NOT TOO DISRUPTIVE
( ) NOT DISRUPTIVE AT ALL

GO RIGHT ON TO THE NEXT PAGE.

16. If you were living in Santa Louisa at the time that this event occurred, how concerned do you think you would be for your personal safety? Would you be very concerned, somewhat concerned, not too concerned, or not concerned at all?

( ) VERY CONCERNED
( ) SOMEWHAT CONCERNED
( ) NOT TOO CONCERNED
( ) NOT CONCERNED AT ALL

CONTINUE READING THE NEXT SECTION.

MORE ABOUT THE EARTHQUAKE

The earthquake was not predicted. Scientists had mapped the fault and determined that it was "active" (in geologic terms, which means that the fault has moved within the last 7,000 years). It was believed that an earthquake of this magnitude was very unlikely in the near future. Scientists know, however, that an earthquake can occur at any time on an active fault.

Because the event was not predicted, residents of the area had no warning that an event was imminent or even very likely to occur. Scientists were, in fact, surprised that the fault was capable of producing an earthquake of this magnitude.

INSTRUCTIONS: ANSWER THE FOLLOWING QUESTIONS <u>BEFORE</u> CONTINUING ON TO THE NEXT SECTION.

17. Even though scientists believed that an earthquake of this magnitude was unlikely to occur, should the scientists have done more research to know more about the earthquake possibilities? Should they have done a lot more research, some research, a little bit more research, or no more research?

( ) A LOT MORE RESEARCH
( ) SOME RESEARCH
( ) A LITTLE BIT MORE RESEARCH
( ) NO MORE RESEARCH

18. Although this event was believed to be very unlikely, should local officials, working with the scientists, have tried to develop a warning system, even if it might only give a few seconds of warning to the community's residents?

( ) DEFINITELY
( ) PROBABLY
( ) PROBABLY NOT
( ) DEFINITELY NOT

GO RIGHT ON TO THE NEXT PAGE.

19. Whose responsibility is it to get such a warning system developed? Please circle the number that best reflects your beliefs about each of the following--a "1" indicates no responsibility; a "10" means high responsibility.

		NO RESP.									HIGH RESP.
		1	2	3	4	5	6	7	8	9	10
A.	Scientists?	1	2	3	4	5	6	7	8	9	10
B.	Local officials?	1	2	3	4	5	6	7	8	9	10
C.	Building owners?	1	2	3	4	5	6	7	8	9	10
D.	Community residents?	1	2	3	4	5	6	7	8	9	10

NOW, CONTINUE ON TO THE NEXT SECTION .

MORE ABOUT THE EARTHQUAKE

The earthquake caused 89 deaths, 450 injuries that needed medical treatment, and thousands of other minor injuries. Almost 4,000 families (26,000 people) evacuated their homes for several hours to several days until they could be assured that their homes were safe.

This was an extremely expensive earthquake in terms of economic losses. It was estimated that damage to structures would cost almost $1 billion to repair. Economic losses to businesses--due to damage to their buildings, loss of utilities, loss of production and office equipment, loss of customers, and loss of inventories and stock--soared to over $2 billion during the 24 months following the earthquake.

City officials estimated that it would take Santa Louisa at least a decade to recover from this earthquake, if it ever really did.

INSTRUCTIONS: ANSWER THE FOLLOWING QUESTIONS <u>BEFORE</u> CONTINUING ON TO THE NEXT SECTION.

20. Given what you now know about the physical nature of this earthquake, how severe do you think the consequences of it were for the community? Do you think they were very severe, somewhat severe, not too severe, or not severe at all?

( ) VERY SEVERE
( ) SOMEWHAT SEVERE
( ) NOT TOO SEVERE
( ) NOT SEVERE AT ALL

GO RIGHT ON TO THE NEXT PAGE.

21. How responsible are the scientists for the damages and losses that occurred due to the earthquake? Are they very responsible, responsible, not too responsible, or not responsible at all?

( ) VERY RESPONSIBLE
( ) RESPONSIBLE
( ) NOT TOO RESPONSIBLE
( ) NOT RESPONSIBLE AT ALL

22. How responsible are the local officials for the damages and losses that occurred? Were they very responsible, responsible, not too responsible, or not responsible at all?

( ) VERY RESPONSIBLE
( ) RESPONSIBLE
( ) NOT TOO RESPONSIBLE
( ) NOT RESPONSIBLE AT ALL

23. How responsible are the owners of the damaged buildings for the losses that occurred? Were they very responsible, responsible, not too responsible, or not responsible at all?

( ) VERY RESPONSIBLE
( ) RESPONSIBLE
( ) NOT TOO RESPONSIBLE
( ) NOT RESPONSIBLE AT ALL

24. Since they weren't concerned about the possibility of a destructive earthquake happening, how responsible were local residents for the damages and losses that occurred?

( ) VERY RESPONSIBLE
( ) RESPONSIBLE
( ) NOT TOO RESPONSIBLE
( ) NOT RESPONSIBLE AT ALL

A

APPENDIX 1

EXPERIMENT 1

SCENARIO: TECHNOLOGICAL DISASTER--MODERATE CONSEQUENCES

UNIVERSITY OF DELAWARE COMMUNITY PERCEPTION STUDY

CERTIFICATE OF INFORMED CONSENT

The purpose and nature of this study has been explained to me. I understand that I will be reading a description of a community and events that take place in it and making some individual judgments about those happenings.

I understand that my participation in this study will have no bearing on my grade in this course, except that I will receive 5 points extra credit for my participation.

I have been informed that all of my responses will remain confidential and that my participation in this study will be anonymous.

I voluntarily agree to participate in this research project.

NAME: (PLEASE PRINT) ________________________________

SIGNATURE: ________________________________

ID #: ________________________

DATE: ________________________

DESCRIPTION OF SANTA LOUISA

The city of Santa Louisa is an older, but growing community located about 5 miles inland on California's central coast, midway between Santa Cruz to the north and Santa Barbara to the south. The city was originally established as one of California's early missions by Father Junipero Serra in 1712, and lies at the bottom of a small, lush valley. The community remained a small farming community until the early 1920's when vacationers along the nearby coast started moving to the area for its small town way of life and healthy climate.

The city was finally incorporated in 1930 and established its first city government. The city center quickly expanded around the old mission district to about eight square blocks with 2 to 6 story buildings constituting the downtown area.

Following World War II, the community became a desirable place to build new light industry because there was sufficient available land around the city center to build the new facilities that would house these modern technologies. As a result, many people moved into the area during the 1950's and 1960's to take jobs in these new plants. As a result, several new housing developments sprang up around the city center.

One of Santa Louisa's main industries remains farming; the area around the city is particularly well-known for its peaches and nectarines. In the hills around Santa Louisa, many well-established vineyards are located. The Santa Susana Valley is second only to the Napa Valley in producing exceptional California wines.

Due to the growing population in this general area of the California coast during the 1960's, the California State University system established a new campus in Santa Louisa in 1969 on the outskirts of the residential areas. The campus was primarily for undergraduate liberal arts and business majors. However, a new prestigious College of Architecture was established to draw both undergraduates and graduate students from throughout the state to this campus.

In the 1970's, the state's Department of Corrections built a medium security prison in the countryside around Santa Louisa. The prison population, now numbering around 4,000, works by farming the 400 acres around the prison.

Today, the central business district in the downtown area consists of local and county government office buildings (Santa Louisa is also the county seat of Santa Susana County), established retail stores, professional office buildings (for doctors, lawyers, and accountants), and many service businesses. While many buildings are modern--having been built since the 1960's--there are also many older and historical structures in the downtown area that date to the mid-1800's. The housing developments surrounding the city center are now "mature" areas with established schools, stores, and small shopping centers. Newer more expensive residential developments are still being built farther from the city center. Interspersed between these residential areas are the manufacturing and high tech plants and business parks that employ many of the city's residents. The population in the 1990 census was 98,765. The University student population adds another 7,500 people who are in the community for at least 9 months each year.

In general, the community has retained its reputation for being a "nice place to live" with its low rate of unemployment, expanding high tech industries, good climate, and clean environment.

INSTRUCTIONS: ANSWER THE FOLLOWING QUESTIONS BEFORE CONTINUING ON TO THE NEXT SECTION.

1. From what you now know about Santa Louisa, how would you assess the quality of life its residents experience? Please circle the number in the following scale that best represents your assessment--a "1" means a very poor quality of life and a "10" means a wonderful quality of life.

VERY POOR									WONDERFUL
1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

2. If you were a resident of Santa Louisa, how desirable do you think it would be to make this community your home? Would it be very desirable, somewhat desirable, somewhat undesirable, or very undesirable?

( ) VERY DESIRABLE
( ) SOMEWHAT DESIRABLE
( ) SOMEWHAT UNDESIRABLE
( ) VERY UNDESIRABLE

Briefly, please explain your answer.

____

____

____

____

3. From what you now know about Santa Louisa, how likely do you think it is that the following events could occur in this community? Please circle the number in the following scale that best represents your assessment--a "1" means the event is not at all likely; a "10" that it is very likely.

		NOT AT ALL LIKELY									VERY LIKELY
		1	2	3	4	5	6	7	8	9	10
A.	High levels of unemployment?	1	2	3	4	5	6	7	8	9	10
B.	A severe flood?	1	2	3	4	5	6	7	8	9	10
C.	A prison riot?	1	2	3	4	5	6	7	8	9	10
D.	High levels of air pollution?	1	2	3	4	5	6	7	8	9	10
E.	A destructive earthquake?	1	2	3	4	5	6	7	8	9	10
F.	A hazardous chemical release from a manufacturing plant?	1	2	3	4	5	6	7	8	9	10
G.	A student demonstration?	1	2	3	4	5	6	7	8	9	10

MORE ABOUT SANTA LOUISA

The community of Santa Louisa had experienced several small hazardous materials events--where small amounts of toxic chemicals had been spilled or vented accidentally--over the past 20 years or so. Of course, recent media attention to similar plant accidents meant that residents know the consequences of large chemical emissions for other communities. For example, due to the chemical emission from the manufacturing plant in West Virginia in 1989, a toxic cloud killed 104, injured 3,400 thousand more, killed or severely injured livestock nearby, and contaminated several hundred acres of farm land.

While the majority of residents know that one local manufacturing plant uses similar toxic chemicals, it had never caused much concern among community residents for their safety.

City agencies (particularly the Police Department, the Fire Department, and the Emergency Management Office) have done some disaster response planning, covering a wide range of disasters that could happen in the city. This will enable them to work more effectively to lessen life loss if a disaster occurs in the city. However, city officials have not undertaken any actions that would improve the safety or safe operation of any of the buildings or facilities in the city, mainly because the city lacks the money to do so.

INSTRUCTIONS: ANSWER THE FOLLOWING QUESTIONS <u>BEFORE</u> CONTINUING ON TO THE NEXT SECTION.

4. Given their experience with the use of toxic chemicals in the manufacturing process, do you think the residents of Santa Louisa should be more concerned about their safety, less concerned, or do they have the right amount of concern?

   ( ) MORE CONCERNED
   ( ) LESS CONCERNED
   ( ) ABOUT RIGHT

GO RIGHT ON TO THE NEXT PAGE.

5. And what about the public officials? Do you think they should be more concerned about the safety of the city's buildings and facilities, less concerned, or do they have the right amount of concern?

( ) MORE CONCERNED
( ) LESS CONCERNED
( ) ABOUT RIGHT

6. If you were a resident of Santa Louisa, how concerned would you be about your safety because of the existence of this type of manufacturing plant? Would you be more concerned than everyone else, less concerned, or have a similar amount of concern?

( ) MORE CONCERNED
( ) LESS CONCERNED
( ) ABOUT THE SAME

7. Do you think that residents of Santa Louisa should take action to prepare themselves and their families to deal with a toxic chemical emission? Given the history in Santa Louisa, but also what they know has happened elsewhere, should Santa Louisa's residents take a lot of action, take some action, take a few actions, or take no action?

( ) TAKE A LOT OF ACTION
( ) TAKE SOME ACTION
( ) TAKE A FEW ACTIONS
( ) TAKE NO ACTION

8. How much trust would you put in local agencies to be able to respond to a large toxic chemical emission that affected Santa Louisa? Would you say you would have a great deal of trust, some trust, not much trust, or no trust at all in their ability to respond to such an event?

( ) GREAT DEAL OF TRUST
( ) SOME TRUST
( ) NOT MUCH TRUST
( ) NO TRUST AT ALL

9. From what you now know about Santa Louisa, how would you assess the quality of life of its residents?

VERY POOR									WONDERFUL
1	2	3	4	5	6	7	8	9	10

NOW, CONTINUE READING THE NEXT PAGE.

AN EVENT IN SANTA LOUISA

At 10:05 on a Wednesday morning in November, 1992, a toxic gas cloud was accidently released from one of the city's plants that manufactured umbrellas from recycled plastics. The toxic gas--pentatetride cyclobromine--is usually harmless when mixed with other chemicals during the manufacturing process. However, in its pure state, the chemical can cause severe breathing problems in humans and animals which can, in some cases, result in long-term lung disease or even death. In high enough concentrations, it can also contaminate soils to the extent that food may not be able to be grown in that soil for several years.

Because there was little wind on the day of the release, the gas cloud rose to about 30 feet off the ground and was disbursed over a relatively small area of the city within several minutes. The cloud wafted across the downtown center as well as its surrounding residential and business park areas. Well before the cloud had reached the outskirts of the city, it had been diluted; however there was still a question about whether it could still contaminate farm crops in the area.

INSTRUCTIONS: ANSWER THE FOLLOWING QUESTIONS <u>BEFORE</u> CONTINUING ON TO THE NEXT SECTION.

10. Given what you know about the physical nature of this toxic gas emission, how severe do you think the consequences of it will be for the community? Do you think they will be very severe, somewhat severe, not too severe, or not severe at all?

    ( ) VERY SEVERE
    ( ) SOMEWHAT SEVERE
    ( ) NOT TOO SEVERE
    ( ) NOT SEVERE AT ALL

11. How many people do you think could be <u>killed</u> by such an event --none, less than 100, more than 100 but less than 1000, more than 1000?

    ( ) NONE
    ( ) LESS THAN 100
    ( ) MORE THAN 100, BUT LESS THAN 1000
    ( ) MORE THAN 1000 (How many? ________________)

GO RIGHT ON TO THE NEXT PAGE.

12. How many people do you think could be <u>injured</u> by such an event--none, less than 100, more than 100 but less than 1000, more than 1000?

( ) NONE
( ) LESS THAN 100
( ) MORE THAN 100, BUT LESS THAN 1000
( ) MORE THAN 1000 (How many? _______________)

13. What percent of the livestock in the farm areas surrounding the community do you think would be killed or harmed by the toxic gas cloud?

( ) NONE

___________%

14. What percent of the agricultural crops in the farm areas surrounding the community do you think would be killed or made inedible by the toxic gas?

( ) NONE

___________%

15. Given that this event has occurred, what consequences do you think it will have for the residents of Santa Louisa; that is, how much will it interfere with their daily lives? Do you think it will be very disruptive, somewhat disruptive, not too disruptive, or not disruptive at all?

( ) VERY DISRUPTIVE
( ) SOMEWHAT DISRUPTIVE
( ) NOT TOO DISRUPTIVE
( ) NOT DISRUPTIVE AT ALL

16. If you were living in Santa Louisa at the time that this event occurred, how concerned do you think you would be for your personal safety? Would you be very concerned, somewhat concerned, not too concerned, or not concerned at all?

( ) VERY CONCERNED
( ) SOMEWHAT CONCERNED
( ) NOT TOO CONCERNED
( ) NOT CONCERNED AT ALL

NOW, CONTINUE READING THE NEXT SECTION.

MORE ABOUT THE TOXIC CHEMICAL EMISSION

The accidental release of this chemical was believed to be very unlikely by the scientists who conducted risk assessment studies for the city before the plant was built. They calculated that such an event was a very low probability event (that is, it would only occur about once in 7,000 years. Over the expected life of the plant, that means that the risk of such an event was extremely low). This plant was relatively new and had many safeguards and backup systems to prevent a release of this toxic chemical into the air. Scientists were, in fact, surprised that a toxic chemical emission of this size could take place.

Because the leak was discovered quickly and the release stopped, a relatively small quantity of the chemical was emitted. The emission of the gas and its rapid dispersion across the community took place so quickly that no warning was given to community residents within the first several minutes.

INSTRUCTIONS: ANSWER THE FOLLOWING QUESTIONS BEFORE CONTINUING ON TO THE NEXT SECTION.

17. Even though scientists believed that a toxic chemical emission of this size was unlikely to occur, should the scientists have done more research to know more about the possibilities of such a leak? Should they have done a lot more research, some research, a little bit more research, or no more research?

    ( ) A LOT MORE RESEARCH
    ( ) SOME RESEARCH
    ( ) A LITTLE BIT MORE RESEARCH
    ( ) NO MORE RESEARCH

18. Although this event was believed to be very unlikely, should local officials, working with the scientists, have tried to develop a warning system, even if it might only give a few seconds of warning to the community's residents?

    ( ) DEFINITELY
    ( ) PROBABLY
    ( ) PROBABLY NOT
    ( ) DEFINITELY NOT

GO RIGHT ON TO THE NEXT PAGE.

19. Whose responsibility is it to get such a warning system developed? Please circle the number that best reflects your beliefs about each of the following--a "1" indicates no responsibility; a "10" means high responsibility.

		NO RESP. 1	2	3	4	5	6	7	8	9	HIGH RESP. 10
A.	Scientists?	1	2	3	4	5	6	7	8	9	10
B.	Local officials?	1	2	3	4	5	6	7	8	9	10
C.	Plant owners?	1	2	3	4	5	6	7	8	9	10
D.	Community residents?	1	2	3	4	5	6	7	8	9	10

NOW, CONTINUE ON TO THE NEXT SECTION .

MORE ABOUT THE TOXIC CHEMICAL EMISSION

The emission of the toxic gas cloud caused 9 deaths, 78 injuries that needed medical treatment, and hundreds of other minor injuries. Almost 200 families (about 1,000 people) evacuated from the community for several hours to several days until they could be assured that their homes were safe.

Long-term health consequences to the population were unknown in the weeks following the event. Although many people had not immediately sought treatment for respiratory ailments, health complaints continued to be reported for some weeks following the event. Sometimes the health problems associated with exposure to this gas do not show up for several months.

In addition to the public health concerns, this was an expensive chemical event in terms of economic losses. Economic losses in agriculture and tourism would be about $200 million during the 24 months following the event.

City officials estimated that it would take Santa Louisa at least two years to recover from this chemical event.

INSTRUCTIONS: ANSWER THE FOLLOWING QUESTIONS <u>BEFORE</u> CONTINUING ON TO THE NEXT SECTION.

20. Given what you now know about the physical nature of this toxic gas emission, how severe do you think the consequences of it were for the community? Do you think they were very severe, somewhat severe, not too severe, or not severe at all?

    ( ) VERY SEVERE
    ( ) SOMEWHAT SEVERE
    ( ) NOT TOO SEVERE
    ( ) NOT SEVERE AT ALL

21. How responsible are the scientists for the health and economic damages and losses that occurred due to the chemical gas emission? Are they very responsible, responsible, not too responsible, or not responsible at all?

    ( ) VERY RESPONSIBLE
    ( ) RESPONSIBLE
    ( ) NOT TOO RESPONSIBLE
    ( ) NOT RESPONSIBLE AT ALL

22. How responsible are the local officials for the health and economic damages and losses that occurred? Were they very responsible, responsible, not too responsible, or not responsible at all?

( ) VERY RESPONSIBLE
( ) RESPONSIBLE
( ) NOT TOO RESPONSIBLE
( ) NOT RESPONSIBLE AT ALL

23. How responsible are the owners and operators of the manufacturing plant for the losses that occurred? Were they very responsible, responsible, not too responsible, or not responsible at all?

( ) VERY RESPONSIBLE
( ) RESPONSIBLE
( ) NOT TOO RESPONSIBLE
( ) NOT RESPONSIBLE AT ALL

24. Since they weren't concerned about the possibility of a harmful chemical emission happening, how responsible were local residents for the health and economic damages and losses that occurred?

( ) VERY RESPONSIBLE
( ) RESPONSIBLE
( ) NOT TOO RESPONSIBLE
( ) NOT RESPONSIBLE AT ALL

D

APPENDIX 1

EXPERIMENT 1

SCENARIO: TECHNOLOGICAL DISASTER--SEVERE CONSEQUENCES

UNIVERSITY OF DELAWARE COMMUNITY PERCEPTION STUDY

CERTIFICATE OF INFORMED CONSENT

The purpose and nature of this study has been explained to me. I understand that I will be reading a description of a community and events that take place in it and making some individual judgments about those happenings.

I understand that my participation in this study will have no bearing on my grade in this course, except that I will receive 5 points extra credit for my participation.

I have been informed that all of my responses will remain confidential and that my participation in this study will be anonymous.

I voluntarily agree to participate in this research project.

NAME: (PLEASE PRINT) ______________________________

SIGNATURE: ______________________________

ID #: ______________________

DATE: ______________________

DESCRIPTION OF SANTA LOUISA

The city of Santa Louisa is an older, but growing community located about 5 miles inland on California's central coast, midway between Santa Cruz to the north and Santa Barbara to the south. The city was originally established as one of California's early missions by Father Junipero Serra in 1712, and lies at the bottom of a small, lush valley. The community remained a small farming community until the early 1920's when vacationers along the nearby coast started moving to the area for its small town way of life and healthy climate.

The city was finally incorporated in 1930 and established its first city government. The city center quickly expanded around the old mission district to about eight square blocks with 2 to 6 story buildings constituting the downtown area.

Following World War II, the community became a desirable place to build new light industry because there was sufficient available land around the city center to build the new facilities that would house these modern technologies. As a result, many people moved into the area during the 1950's and 1960's to take jobs in these new plants. As a result, several new housing developments sprang up around the city center.

One of Santa Louisa's main industries remains farming; the area around the city is particularly well-known for its peaches and nectarines. In the hills around Santa Louisa, many well-established vineyards are located. The Santa Susana Valley is second only to the Napa Valley in producing exceptional California wines.

Due to the growing population in this general area of the California coast during the 1960's, the California State University system established a new campus in Santa Louisa in 1969 on the outskirts of the residential areas. The campus was primarily for undergraduate liberal arts and business majors. However, a new prestigious College of Architecture was established to draw both undergraduates and graduate students from throughout the state to this campus.

In the 1970's, the state's Department of Corrections built a medium security prison in the countryside around Santa Louisa. The prison population, now numbering around 4,000, works by farming the 400 acres around the prison.

Today, the central business district in the downtown area consists of local and county government office buildings (Santa Louisa is also the county seat of Santa Susana County), established retail stores, professional office buildings (for doctors, lawyers, and accountants), and many service businesses. While many buildings are modern--having been built since the 1960's--there are also many older and historical structures in the downtown area that date to the mid-1800's. The housing developments surrounding the city center are now "mature" areas with established schools, stores, and small shopping centers. Newer more expensive residential developments are still being built farther from the city center. Interspersed between these residential areas are the manufacturing and high tech plants and business parks that employ many of the city's residents. The population in the 1990 census was 98,765. The University student population adds another 7,500 people who are in the community for at least 9 months each year.

In general, the community has retained its reputation for being a "nice place to live" with its low rate of unemployment, expanding high tech industries, good climate, and clean environment.

INSTRUCTIONS: ANSWER THE FOLLOWING QUESTIONS <u>BEFORE</u> CONTINUING ON TO THE NEXT SECTION.

1. From what you now know about Santa Louisa, how would you assess the quality of life its residents experience? Please circle the number in the following scale that best represents your assessment--a "1" means a very poor quality of life and a "10" means a wonderful quality of life.

VERY POOR									WONDERFUL
1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

2. If you were a resident of Santa Louisa, how desirable do you think it would be to make this community your home? Would it be very desirable, somewhat desirable, somewhat undesirable, or very undesirable?

( ) VERY DESIRABLE
( ) SOMEWHAT DESIRABLE
( ) SOMEWHAT UNDESIRABLE
( ) VERY UNDESIRABLE

Briefly, please explain your answer.

____

____

____

____

3. From what you now know about Santa Louisa, how likely do you think it is that the following events could occur in this community? Please circle the number in the following scale that best represents your assessment--a "1" means the event is not at all likely; a "10" that it is very likely.

		NOT AT ALL LIKELY									VERY LIKELY
		1	2	3	4	5	6	7	8	9	10
A.	High levels of unemployment?	1	2	3	4	5	6	7	8	9	10
B.	A severe flood?	1	2	3	4	5	6	7	8	9	10
C.	A prison riot?	1	2	3	4	5	6	7	8	9	10
D.	High levels of air pollution?	1	2	3	4	5	6	7	8	9	10
E.	A destructive earthquake?	1	2	3	4	5	6	7	8	9	10
F.	A hazardous chemical release from a manufacturing plant?	1	2	3	4	5	6	7	8	9	10
G.	A student demonstration?	1	2	3	4	5	6	7	8	9	10

MORE ABOUT SANTA LOUISA

The community of Santa Louisa had experienced several small hazardous materials events--where small amounts of toxic chemicals had been spilled or vented accidentally--over the past 20 years or so. Of course, recent media attention to similar plant accidents meant that residents know the consequences of large chemical emissions for other communities. For example, due to the chemical emission from the manufacturing plant in West Virginia in 1989, a toxic cloud killed 104, injured 3,400 thousand more, killed or severely injured livestock nearby, and contaminated several hundred acres of farm land.

While the majority of residents know that one local manufacturing plant uses similar toxic chemicals, it had never caused much concern among community residents for their safety.

City agencies (particularly the Police Department, the Fire Department, and the Emergency Management Office) have done some disaster response planning, covering a wide range of disasters that could happen in the city. This will enable them to work more effectively to lessen life loss if a disaster occurs in the city. However, city officials have not undertaken any actions that would improve the safety or safe operation of any of the buildings or facilities in the city, mainly because the city lacks the money to do so.

INSTRUCTIONS: ANSWER THE FOLLOWING QUESTIONS <u>BEFORE</u> CONTINUING ON TO THE NEXT SECTION.

4. Given their experience with the use of toxic chemicals in the manufacturing process, do you think the residents of Santa Louisa should be more concerned about their safety, less concerned, or do they have the right amount of concern?

   ( ) MORE CONCERNED
   ( ) LESS CONCERNED
   ( ) ABOUT RIGHT

GO RIGHT ON TO THE NEXT PAGE.

5. And what about the public officials? Do you think they should be more concerned about the safety of the city's buildings and facilities, less concerned, or do they have the right amount of concern?

( ) MORE CONCERNED
( ) LESS CONCERNED
( ) ABOUT RIGHT

6. If you were a resident of Santa Louisa, how concerned would **you** be about your safety because of the existence of this type of manufacturing plant? Would you be more concerned than everyone else, less concerned, or have a similar amount of concern?

( ) MORE CONCERNED
( ) LESS CONCERNED
( ) ABOUT THE SAME

7. Do you think that residents of Santa Louisa should take action to prepare themselves and their families to deal with a toxic chemical emission? Given the history in Santa Louisa, but also what they know has happened elsewhere, should Santa Louisa's residents take a lot of action, take some action, take a few actions, or take no action?

( ) TAKE A LOT OF ACTION
( ) TAKE SOME ACTION
( ) TAKE A FEW ACTIONS
( ) TAKE NO ACTION

8. How much trust would you put in local agencies to be able to respond to a large toxic chemical emission that affected Santa Louisa? Would you say you would have a great deal of trust, some trust, not much trust, or no trust at all in their ability to respond to such an event?

( ) GREAT DEAL OF TRUST
( ) SOME TRUST
( ) NOT MUCH TRUST
( ) NO TRUST AT ALL

9. From what you now know about Santa Louisa, how would you assess the quality of life of its residents?

VERY POOR — WONDERFUL

1 2 3 4 5 6 7 8 9 10

AN EVENT IN SANTA LOUISA

At 10:05 on a Wednesday morning in November, 1992, a toxic gas cloud was accidently released from one of the city's plants that manufactured umbrellas from recycled plastics. The toxic gas--pentatetride cyclobromine--is usually harmless when mixed with other chemicals during the manufacturing process. However, in its pure state, the chemical can cause severe breathing problems in humans and animals which can, in some cases, result in long-term lung disease or even death. In high enough concentrations, it can also contaminate soils to the extent that food may not be able to be grown in that soil for several years.

Because of the strong, low winds on the day of the release, the gas cloud remained low to the ground and was disbursed across the entire community within several minutes, permeating the downtown center as well as its surrounding residential and business park areas. By the time the cloud reached the outskirts of the city, it was still potent enough to cause damage in farm animals and to contaminate hundreds of acres of farm land and vineyards.

INSTRUCTIONS: ANSWER THE FOLLOWING QUESTIONS BEFORE CONTINUING ON TO THE NEXT SECTION.

10. Given what you know about the physical nature of this toxic gas emission, how severe do you think the consequences of it will be for the community? Do you think they will be very severe, somewhat severe, not too severe, or not severe at all?

    ( ) VERY SEVERE
    ( ) SOMEWHAT SEVERE
    ( ) NOT TOO SEVERE
    ( ) NOT SEVERE AT ALL

11. How many people do you think could be killed by such an event --none, less than 100, more than 100 but less than 1000, more than 1000?

    ( ) NONE
    ( ) LESS THAN 100
    ( ) MORE THAN 100, BUT LESS THAN 1000
    ( ) MORE THAN 1000 (How many? _______________)

GO RIGHT ON TO THE NEXT PAGE.

12. How many people do you think could be <u>injured</u> by such an event--none, less than 100, more than 100 but less than 1000, more than 1000?

( ) NONE
( ) LESS THAN 100
( ) MORE THAN 100, BUT LESS THAN 1000
( ) MORE THAN 1000 (How many? ________________)

13. What percent of the livestock in the farm areas surrounding the community do you think would be killed or harmed by the toxic gas cloud?

( ) NONE

____________%

14. What percent of the agricultural crops in the farm areas surrounding the community do you think would be killed or made inedible by the toxic gas?

( ) NONE

____________%

15. Given that this event has occurred, what consequences do you think it will have for the residents of Santa Louisa; that is, how much will it interfere with their daily lives? Do you think it will be very disruptive, somewhat disruptive, not too disruptive, or not disruptive at all?

( ) VERY DISRUPTIVE
( ) SOMEWHAT DISRUPTIVE
( ) NOT TOO DISRUPTIVE
( ) NOT DISRUPTIVE AT ALL

16. If you were living in Santa Louisa at the time that this event occurred, how concerned do you think you would be for your personal safety? Would you be very concerned, somewhat concerned, not too concerned, or not concerned at all?

( ) VERY CONCERNED
( ) SOMEWHAT CONCERNED
( ) NOT TOO CONCERNED
( ) NOT CONCERNED AT ALL

NOW, CONTINUE READING THE NEXT SECTION.

MORE ABOUT THE TOXIC CHEMICAL EMISSION

The accidental release of this chemical was believed to be very unlikely by the scientists who conducted risk assessment studies for the city before the plant was built. They calculated that such an event was a very low probability event (that is, it would only occur about once in 7,000 years. Over the expected life of the plant, that means that the risk of such an event was extremely low). This plant was relatively new and had many safeguards and backup systems to prevent a release of this toxic chemical into the air. Scientists were, in fact, surprised that a toxic chemical emission of this size could take place.

Although the leak was discovered quickly and the release stopped, a large quantity of the chemical was emitted. The emission of the gas and its rapid dispersion across the community took place so quickly that no warning was given to community residents within the first several minutes.

INSTRUCTIONS: ANSWER THE FOLLOWING QUESTIONS <u>BEFORE</u> CONTINUING ON TO THE NEXT SECTION.

17. Even though scientists believed that a toxic chemical emission of this size was unlikely to occur, should the scientists have done more research to know more about the possibilities of such a leak? Should they have done a lot more research, some research, a little bit more research, or no more research?

( ) A LOT MORE RESEARCH
( ) SOME RESEARCH
( ) A LITTLE BIT MORE RESEARCH
( ) NO MORE RESEARCH

18. Although this event was believed to be very unlikely, should local officials, working with the scientists, have tried to develop a warning system, even if it might only give a few seconds of warning to the community's residents?

( ) DEFINITELY
( ) PROBABLY
( ) PROBABLY NOT
( ) DEFINITELY NOT

GO RIGHT ON TO THE NEXT PAGE.

19. Whose responsibility is it to get such a warning system developed? Please circle the number that best reflects your beliefs about each of the following--a "1" indicates no responsibility; a "10" means high responsibility.

		NO RESP.									HIGH RESP.
		1	2	3	4	5	6	7	8	9	10
A.	Scientists?	1	2	3	4	5	6	7	8	9	10
B.	Local officials?	1	2	3	4	5	6	7	8	9	10
C.	Plant owners?	1	2	3	4	5	6	7	8	9	10
D.	Community residents?	1	2	3	4	5	6	7	8	9	10

NOW, CONTINUE ON TO THE NEXT SECTION .

MORE ABOUT THE TOXIC CHEMICAL EMISSION

The emission of the toxic gas cloud caused 89 deaths, 450 injuries that needed medical treatment, and thousands of other minor injuries. Almost 4,000 families (26,000 people) evacuated their homes for several hours to several days until they could be assured that their homes were safe.

Long-term health consequences to the population were unknown in the weeks following the event. Although many people had not immediately sought treatment for respiratory ailments, health complaints continued to rise for several months following the event. Sometimes the health problems associated with exposure to this gas did not show up for several months or even years.

In addition to the public health concerns, this was an extremely expensive chemical event in terms of economic losses. Economic losses in agriculture and tourism soared to over $2 billion during the 24 months following the event.

City officials estimated that it would take Santa Louisa at least a decade to recover from this chemical event, if it ever really did.

INSTRUCTIONS: ANSWER THE FOLLOWING QUESTIONS BEFORE CONTINUING ON TO THE NEXT SECTION.

20. Given what you now know about the physical nature of this toxic gas emission, how severe do you think the consequences of it were for the community? Do you think they were very severe, somewhat severe, not too severe, or not severe at all?

    ( ) VERY SEVERE
    ( ) SOMEWHAT SEVERE
    ( ) NOT TOO SEVERE
    ( ) NOT SEVERE AT ALL

GO RIGHT ON TO THE NEXT PAGE.

21. How responsible are the scientists for the health and economic damages and losses that occurred due to the chemical gas emission? Are they very responsible, responsible, not too responsible, or not responsible at all?

( ) VERY RESPONSIBLE
( ) RESPONSIBLE
( ) NOT TOO RESPONSIBLE
( ) NOT RESPONSIBLE AT ALL

22. How responsible are the local officials for the health and economic damages and losses that occurred? Were they very responsible, responsible, not too responsible, or not responsible at all?

( ) VERY RESPONSIBLE
( ) RESPONSIBLE
( ) NOT TOO RESPONSIBLE
( ) NOT RESPONSIBLE AT ALL

23. How responsible are the owners and operators of the manufacturing plant for the losses that occurred? Were they very responsible, responsible, not too responsible, or not responsible at all?

( ) VERY RESPONSIBLE
( ) RESPONSIBLE
( ) NOT TOO RESPONSIBLE
( ) NOT RESPONSIBLE AT ALL

24. Since they weren't concerned about the possibility of a harmful chemical emission happening, how responsible were local residents for the health and economic damages and losses that occurred?

( ) VERY RESPONSIBLE
( ) RESPONSIBLE
( ) NOT TOO RESPONSIBLE
( ) NOT RESPONSIBLE AT ALL

B

APPENDIX 1

EXPERIMENT 2

SCENARIO: NATURAL DISASTER--MODERATE CONSEQUENCES

UNIVERSITY OF DELAWARE COMMUNITY PERCEPTION STUDY

CERTIFICATE OF INFORMED CONSENT

The purpose and nature of this study has been explained to me. I understand that I will be reading a description of a community and events that take place in it and making some individual judgments about those happenings.

I understand that my participation in this study will have no bearing on my grade in this course, except that I will receive 5 points extra credit for my participation.

I have been informed that all of my responses will remain confidential and that my participation in this study will be anonymous.

I voluntarily agree to participate in this research project.

NAME: (PLEASE PRINT) ______________________________

SIGNATURE: ______________________________

DATE: ______________________________

DESCRIPTION OF SANTA LOUISA

The city of Santa Louisa is an older, but growing community located about 5 miles inland on California's central coast, midway between Santa Cruz to the north and Santa Barbara to the south. The city was originally established as one of California's early missions by Father Junipero Serra in 1712, and lies at the bottom of a small, lush valley. The community remained a small farming community until the early 1920's when vacationers along the nearby coast started moving to the area for its small town way of life and healthy climate.

The city was finally incorporated in 1930 and established its first city government. The city center quickly expanded around the old mission district to about eight square blocks with 2 to 6 story buildings constituting the downtown area.

Following World War II, the community became a desirable place to build new light industry because there was sufficient available land around the city center to build the new facilities that would house these modern technologies. As a result, many people moved into the area during the 1950's and 1960's to take jobs in these new plants. As a result, several new housing developments sprang up around the city center.

One of Santa Louisa's main industries remains farming; the area around the city is particularly well-known for its peaches and nectarines. In the hills around Santa Louisa, many well-established vineyards are located. The Santa Susana Valley is second only to the Napa Valley in producing exceptional California wines.

Due to the growing population in this general area of the California coast during the 1960's, the California State University system established a new campus in Santa Louisa in 1969 on the outskirts of the residential areas. The campus was primarily for undergraduate liberal arts and business majors. However, a new prestigious College of Architecture was established to draw both undergraduates and graduate students from throughout the state to this campus.

In the 1970's, the state's Department of Corrections built a medium security prison in the countryside around Santa Louisa. The prison population, now numbering around 4,000, farms the 400 acres around the prison.

Today, the central business district in the downtown area consists of local and county government office buildings (Santa Louisa is also the county seat of Santa Susana County), established retail stores, professional office buildings (for doctors, lawyers, and accountants), and many service businesses. While many buildings are modern--having been built since the 1960's--there are also many older and historical structures in the downtown area that date to the mid-1800's. The housing developments surrounding the city center are now "mature" areas with established schools, stores, and small shopping centers. Newer more expensive residential developments are still being built farther from the city center. Interspersed between these residential areas are the manufacturing and high tech plants and business parks that employ many of the city's residents. The population in the 1990 census was 98,765. The University student population adds another 7,500 people who are in the community for at least 9 months each year.

In general, the community has retained its reputation for being a "nice place to live" with its low rate of unemployment, expanding high tech industries, good climate, and clean environment.

INSTRUCTIONS: ANSWER THE FOLLOWING QUESTION <u>BEFORE</u> CONTINUING ON TO THE NEXT SECTION.

1. From what you now know about Santa Louisa, how would <u>you</u> assess the quality of life its residents experience? Please circle the number in the following scale that best represents your assessment--a "1" means a very poor quality of life and a "10" means a wonderful quality of life.

VERY POOR									WONDERFUL
1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

MORE ABOUT SANTA LOUISA

The community of Santa Louisa had experienced several small earthquakes--that mostly just gently shook the city's inhabitants--over the past 20 years or so. Being in California's "earthquake belt," of course, meant that residents knew what consequences earthquakes had for other nearby small communities as well as for the larger urban areas in the state. For example, the Loma Prieta earthquake in October, 1989 killed 104 people, injured 3,400 others, caused the collapse of an elevated freeway, largely destroyed Santa Cruz's downtown district, and damaged many multi-storied buildings in the San Francisco Bay Area.

While the majority of residents knew that the Los Osos Fault existed near the city, it had never caused much concern among community residents for their safety.

City agencies (particularly the Police Department, the Fire Department, and the Emergency Management Office) have done some disaster response planning, covering a wide range of disasters that could happen in the city. This will enable them to work more effectively to lessen life loss if a disaster occurs in the city. However, city officials have not undertaken any actions that would improve the safety or safe operation of any of the buildings or facilities in the city, mainly because the city lacks the money to do so.

INSTRUCTIONS: ANSWER THE FOLLOWING QUESTIONS <u>BEFORE</u> CONTINUING ON TO THE NEXT SECTION.

2. Given their experience with earthquakes, how concerned do you think the residents of Santa Louisa should be about their safety? (CIRCLE ONE)

NOT CONCERNED AT ALL — VERY CONCERNED

1 2 3 4 5 6 7 8 9 10

GO RIGHT ON TO THE NEXT PAGE.

3. And what about the public officials? How concerned do you think they should be about the safety of the city's buildings and facilities? (CIRCLE ONE)

NOT CONCERNED AT ALL									VERY CONCERNED
1	2	3	4	5	6	7	8	9	10

4. If you were a resident of Santa Louisa, how concerned would you be about your safety because of the existence of the earthquake fault? (CIRCLE ONE)

NOT CONCERNED AT ALL									VERY CONCERNED
1	2	3	4	5	6	7	8	9	10

5. Given the history in Santa Louisa, and also what they know has happened elsewhere, what amount of action should residents of Santa Louisa take to prepare themselves and their families to deal with a future earthquake? (CIRCLE ONE)

NO NEW ACTION IS NEEDED									A GREAT DEAL OF ACTION
1	2	3	4	5	6	7	8	9	10

6. How much trust would you put in local agencies to be able to respond to a large earthquake that affected Santa Louisa? (CIRCLE ONE)

NO TRUST									A GREAT DEAL OF TRUST
1	2	3	4	5	6	7	8	9	10

7. From what you now know about Santa Louisa, how would you assess the quality of life of its residents?

VERY POOR									WONDERFUL
1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

8. Please circle how important you think it is that the following actions be taken in Santa Louisa.

A. Conduct a scientific assessment of the likelihood that a major earthquake could effect Santa Louisa.

NOT AT ALL IMPORTANT									VERY IMPORTANT
1	2	3	4	5	6	7	8	9	10

B. Conduct an assessment of how vulnerable the community would be if a major earthquake occurred (that is, how many buildings, systems, or structures are likely to fail).

NOT AT ALL IMPORTANT									VERY IMPORTANT
1	2	3	4	5	6	7	8	9	10

C. Designing and building new structures that are resistant to earthquakes.

NOT AT ALL IMPORTANT									VERY IMPORTANT
1	2	3	4	5	6	7	8	9	10

D. Requiring that older buildings be strengthened so they will not collapse in an earthquake.

NOT AT ALL IMPORTANT									VERY IMPORTANT
1	2	3	4	5	6	7	8	9	10

E. Educate the community about the risk of an earthquake and about what to do if an earthquake occurs.

NOT AT ALL IMPORTANT									VERY IMPORTANT
1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

F. Strengthen and enforce building codes and land use regulations that would reduce earthquake damage.

NOT AT ALL IMPORTANT									VERY IMPORTANT
1	2	3	4	5	6	7	8	9	10

G. Develop a warning system for earthquakes.

NOT AT ALL IMPORTANT									VERY IMPORTANT
1	2	3	4	5	6	7	8	9	10

H. Purchase earthquake insurance.

NOT AT ALL IMPORTANT									VERY IMPORTANT
1	2	3	4	5	6	7	8	9	10

9. Please indicate who, if anyone, is responsible for undertaking the following actions in Santa Louisa. Please circle the number that best reflects your beliefs about the responsibility of each of the parties for each action specified. A "1" indicates no responsibility; a "10" means high responsibility.

A. Conduct a scientific assessment of the likelihood that a major earthquake could effect Santa Louisa.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

B. Conduct an assessment of how vulnerable the community would be if a major earthquake occurred (that is, how many buildings, systems or structures are likely to fail).

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Businesses owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

C. Designing and building new structures that are resistant to earthquakes.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

D. Require that older buildings be strengthened so they will not collapse in an earthquake.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

E. Educate the community about the risk of an earthquake and about what to do if an earthquake occurs.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

F. Strengthen and enforce building codes and land use regulations that would reduce earthquake damage.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

G. Develop a warning system for earthquakes.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

H. Purchase earthquake insurance.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

AFTER YOU HAVE ANSWERED THESE QUESTIONS, GO ON TO THE NEXT SECTION.

AN EVENT IN SANTA LOUISA

At 10:05 on a Wednesday morning in November, 1992, a 5.2 earthquake rocked the city of Santa Louisa and its surrounding suburbs. The earthquake resulted from the movement on a known fault--the Los Osos Fault--that had not been active recently. The fault is about 3 miles from the city center, just beyond the city limits.

The initial earthquake shock shook the ground for only about 8 seconds, a relatively short time for an earthquake in this area.

Because the soils underneath the city are uncompacted alluvial sediments, the earthquake caused all areas of the city to experience some shaking. The damages and losses from the earthquake occurred throughout the city--in its downtown center as well as its surrounding residential and business park areas. However, few other nearby communities sustained any damage or losses from this earthquake event.

The earthquake was not predicted. Scientists had previously mapped the fault and determined that it was "active" (in geologic terms, which means that the fault has moved within the last 7,000 years). It was believed that an earthquake of this magnitude was very unlikely in the near future. Scientists know, however, that an earthquake can occur at any time on an active fault.

Because the event was not predicted, residents of the area had no warning that an event was imminent or even very likely to occur. Scientists were, in fact, surprised that the fault was capable of producing an earthquake of this magnitude.

The earthquake caused 9 deaths, 78 injuries that needed medical treatment, and hundreds of other minor injuries. Almost 200 families (about 1,000 people) evacuated their homes for several hours to several days until they could be assured that their homes were safe.

This was an expensive earthquake in terms of economic losses. It was estimated that damage to structures would cost almost $100 million to repair. Economic losses to businesses--due to damage to their buildings, loss of utilities, loss of production and office equipment, loss of customers, and loss of inventories and stock--would be about $200 million during the 24 months following the earthquake.

City officials estimated that it would take Santa Louisa at least two years to recover from this earthquake.

GO RIGHT ON TO THE NEXT PAGE.

10. Given what you now know about the physical nature of the earthquake, how severe do you think the consequences of it were for the community?

NOT AT ALL SEVERE									VERY SEVERE
1	2	3	4	5	6	7	8	9	10

11. Which of the following parties, if any, is responsible for various ways of compensating victims or ways of recovering from the earthquake? Please circle the number that best reflects your beliefs about the responsibility of each of the parties for each item specified. A "1" indicates no responsibility; a "10" means high responsibility.

A. Compensation for deaths and personal injuries due to the earthquake.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Local businesses	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

B. Assistance to help businesses recover.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

C. Restoration of ruined public buildings, including schools, the prison, and City Hall.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

D. Restoration of the Mission.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

E. Restoration of damaged or destroyed private homes.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

F. Restoration of damaged or destroyed rental houses or apartment buildings.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

G. Removal and clean-up of earthquake-caused debris.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

12. Any additional comments about who is responsible for helping Santa Louisa recover from the earthquake, or what people should do:

____

THAT COMPLETES OUR STUDY. THANK YOU FOR PARTICIPATING!!

C
Class

APPENDIX 1

EXPERIMENT 2

SCENARIO: TECHNOLOGICAL DISASTER--MODERATE CONSEQUENCES

UNIVERSITY OF DELAWARE COMMUNITY PERCEPTION STUDY

CERTIFICATE OF INFORMED CONSENT

The purpose and nature of this study has been explained to me. I understand that I will be reading a description of a community and events that take place in it and making some individual judgments about those happenings.

I understand that my participation in this study will have no bearing on my grade in this course, except that I will receive 5 points extra credit for my participation.

I have been informed that all of my responses will remain confidential and that my participation in this study will be anonymous.

I voluntarily agree to participate in this research project.

NAME: (PLEASE PRINT) ______________________________

SIGNATURE: ______________________________

DATE: ______________________________

DESCRIPTION OF SANTA LOUISA

The city of Santa Louisa is an older, but growing community located about 5 miles inland on California's central coast, midway between Santa Cruz to the north and Santa Barbara to the south. The city was originally established as one of California's early missions by Father Junipero Serra in 1712, and lies at the bottom of a small, lush valley. The community remained a small farming community until the early 1920's when vacationers along the nearby coast started moving to the area for its small town way of life and healthy climate.

The city was finally incorporated in 1930 and established its first city government. The city center quickly expanded around the old mission district to about eight square blocks with 2 to 6 story buildings constituting the downtown area.

Following World War II, the community became a desirable place to build new light industry because there was sufficient available land around the city center to build the new facilities that would house these modern technologies. As a result, many people moved into the area during the 1950's and 1960's to take jobs in these new plants. As a result, several new housing developments sprang up around the city center.

One of Santa Louisa's main industries remains farming; the area around the city is particularly well-known for its peaches and nectarines. In the hills around Santa Louisa, many well-established vineyards are located. The Santa Susana Valley is second only to the Napa Valley in producing exceptional California wines.

Due to the growing population in this general area of the California coast during the 1960's, the California State University system established a new campus in Santa Louisa in 1969 on the outskirts of the residential areas. The campus was primarily for undergraduate liberal arts and business majors. However, a new prestigious College of Architecture was established to draw both undergraduates and graduate students from throughout the state to this campus.

In the 1970's, the state's Department of Corrections built a medium security prison in the countryside around Santa Louisa. The prison population, now numbering around 4,000, works by farming the 400 acres around the prison.

Today, the central business district in the downtown area consists of local and county government office buildings (Santa Louisa is also the county seat of Santa Susana County), established retail stores, professional office buildings (for doctors, lawyers, and accountants), and many service businesses. While many buildings are modern--having been built since the 1960's--there are also many older and historical structures in the downtown area that date to the mid-1800's. The housing developments surrounding the city center are now "mature" areas with established schools, stores, and small shopping centers. Newer more expensive residential developments are still being built farther from the city center. Interspersed between these residential areas are the manufacturing and high tech plants and business parks that employ many of the city's residents. The population in the 1990 census was 98,765. The University student population adds another 7,500 people who are in the community for at least 9 months each year.

In general, the community has retained its reputation for being a "nice place to live" with its low rate of unemployment, expanding high tech industries, good climate, and clean environment.

INSTRUCTIONS: ANSWER THE FOLLOWING QUESTION BEFORE CONTINUING ON TO THE NEXT SECTION.

1. From what you now know about Santa Louisa, how would you assess the quality of life its residents experience? Please circle the number in the following scale that best represents your assessment--a "1" means a very poor quality of life and a "10" means a wonderful quality of life.

VERY POOR									WONDERFUL
1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT SECTION.

MORE ABOUT SANTA LOUISA

The community of Santa Louisa had experienced several small hazardous materials events--where small amounts of toxic chemicals had been spilled or vented accidentally--over the past 20 years or so. Of course, recent media attention to similar plant accidents meant that residents know the consequences of large chemical emissions for other communities. For example, due to the chemical emission from the manufacturing plant in West Virginia in 1989, a toxic cloud killed 104, injured 3,400 thousand more, killed or severely injured livestock nearby, and contaminated several hundred acres of farm land.

While the majority of residents know that one local manufacturing plant uses similar toxic chemicals, it had never caused much concern among community residents for their safety.

City agencies (particularly the Police Department, the Fire Department, and the Emergency Management Office) have done some disaster response planning, covering a wide range of disasters that could happen in the city. This will enable them to work more effectively to lessen life loss if a disaster occurs in the city. However, city officials have not undertaken any actions that would improve the safety or safe operation of any of the buildings or facilities in the city, mainly because the city lacks the money to do so.

INSTRUCTIONS: ANSWER THE FOLLOWING QUESTIONS <u>BEFORE</u> CONTINUING ON TO THE NEXT SECTION.

2. Given their experience with the use of toxic chemicals in the manufacturing process, how concerned do you think the residents of Santa Louisa should be about their safety? (CIRCLE ONE)

NOT CONCERNED AT ALL									VERY CONCERNED
1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

3. And what about the public officials? How concerned do you think they should be about the safety of the city's buildings and facilities? (CIRCLE ONE)

NOT CONCERNED AT ALL									VERY CONCERNED
1	2	3	4	5	6	7	8	9	10

4. If you were a resident of Santa Louisa, how concerned would you be about your safety because of the existence of this type of manufacturing plant? (CIRCLE ONE)

NOT CONCERNED AT ALL									VERY CONCERNED
1	2	3	4	5	6	7	8	9	10

5. Given the history in Santa Louisa, and also what they know has happened elsewhere, what amount of action should residents of Santa Louisa take to prepare themselves and their families to deal with a toxic chemical emission? (CIRCLE ONE)

NO NEW ACTION IS NEEDED									A GREAT DEAL OF ACTION
1	2	3	4	5	6	7	8	9	10

6. How much trust would you put in local agencies to be able to respond to a large toxic chemical emission that affected Santa Louisa? (CIRCLE ONE)

NO TRUST									A GREAT DEAL OF TRUST
1	2	3	4	5	6	7	8	9	10

7. From what you now know about Santa Louisa, how would you assess the quality of life of its residents?

VERY POOR									WONDERFUL
1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

8. Please circle how important you think it is that the following actions be taken in Santa Louisa.

A. Conduct a scientific assessment of the likelihood that the emission of a toxic chemical from one of the manufacturing plants could effect Santa Louisa.

NOT AT ALL IMPORTANT									VERY IMPORTANT
1	2	3	4	5	6	7	8	9	10

B. Conduct an assessment of how vulnerable the community would be if a large chemical emission occurred (that is, how would human health, environmental quality, and local businesses be effected).

NOT AT ALL IMPORTANT									VERY IMPORTANT
1	2	3	4	5	6	7	8	9	10

C. Designing and building new plants that use toxic chemicals that are less likely to have accidental emissions.

NOT AT ALL IMPORTANT									VERY IMPORTANT
1	2	3	4	5	6	7	8	9	10

D. Requiring that older plants be strengthened so they will be less likely to fail (that is, have chemical emissions).

NOT AT ALL IMPORTANT									VERY IMPORTANT
1	2	3	4	5	6	7	8	9	10

E. Educate the community about the risk of a toxic chemical emission and about what to do if it occurs.

NOT AT ALL IMPORTANT									VERY IMPORTANT
1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

F. Strengthen and enforce building codes and land use regulations that would reduce the likelihood that a toxic chemical emission would harm the community.

NOT AT ALL IMPORTANT									VERY IMPORTANT
1	2	3	4	5	6	7	8	9	10

G. Develop a warning system for toxic chemical emissions.

NOT AT ALL IMPORTANT									VERY IMPORTANT
1	2	3	4	5	6	7	8	9	10

H. Purchase insurance.

NOT AT ALL IMPORTANT									VERY IMPORTANT
1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

9. Please indicate who, if anyone, is responsible for undertaking the following actions in Santa Louisa. Please circle the number that best reflects your beliefs about the responsibility of each of the parties for each action specified. A "1" indicates no responsibility; a "10" means high responsibility.

A. Conduct a scientific assessment of the likelihood that the emission of a toxic chemical from one of the manufacturing plants could effect Santa Louisa.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Owners of the chemical plants	1	2	3	4	5	6	7	8	9	10
Operators of the chemical plants	1	2	3	4	5	6	7	8	9	10
Other business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

B. Conduct an assessment of how vulnerable the community would be if a large chemical emission occurred (that is, how would human health, environmental quality, and local businesses be effected).

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Owners of the chemical plants	1	2	3	4	5	6	7	8	9	10
Operators of the chemical plants	1	2	3	4	5	6	7	8	9	10
Other business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

C. Designing and building new plants that use toxic chemicals so they are less likely to have accidental emissions.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Owners of the chemical plants	1	2	3	4	5	6	7	8	9	10
Operators of the chemical plants	1	2	3	4	5	6	7	8	9	10
Other business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

D. Requiring that older plants be strengthened so they will be less likely to fail (that is, to have chemical emissions).

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Owners of the chemical plants	1	2	3	4	5	6	7	8	9	10
Operators of the chemical plants	1	2	3	4	5	6	7	8	9	10
Other business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

E. Educate the community about the risk of a toxic chemical emission and about what to do if it occurs.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Owners of the chemical plants	1	2	3	4	5	6	7	8	9	10
Operators of the chemical plants	1	2	3	4	5	6	7	8	9	10
Other business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

F. Strengthen and enforce building codes and land use regulations that would reduce the likelihood that a toxic chemical emission could harm the community.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Owners of the chemical plants	1	2	3	4	5	6	7	8	9	10
Operators of the chemical plants	1	2	3	4	5	6	7	8	9	10
Other business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

G. Develop a warning system for toxic chemical emissions.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Owners of the chemical plants	1	2	3	4	5	6	7	8	9	10
Operators of the chemical plants	1	2	3	4	5	6	7	8	9	10
Other business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

H. Purchase insurance.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Owners of the chemical plants	1	2	3	4	5	6	7	8	9	10
Operators of the chemical plants	1	2	3	4	5	6	7	8	9	10
Other business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

NOW, CONTINUE READING THE NEXT SECTION.

AN EVENT IN SANTA LOUISA

At 10:05 on a Wednesday morning in November, 1992, a toxic gas cloud was accidently released from one of the city's plants that manufactured umbrellas from recycled plastics. The toxic gas--pentatetride cyclobromine--is usually harmless when mixed with other chemicals during the manufacturing process. However, in its pure state, the chemical can cause severe breathing problems in humans and animals which can, in some cases, result in long-term lung disease or even death. In high enough concentrations, it can also contaminate soils to the extent that food may not be able to be grown in that soil for several years.

Because there was little wind on the day of the release, the gas cloud rose to about 30 feet off the ground and was disbursed over a relatively small area of the city within several minutes. The cloud wafted across the downtown center as well as its surrounding residential and business park areas. Well before the cloud had reached the outskirts of the city, it had been diluted; however there was still a question about whether it could still contaminate farm crops in the area.

The accidental release of this chemical was believed to be very unlikely by the scientists who conducted risk assessment studies for the city before the plant was built. They calculated that such an event was a very low probability event (that is, it would only occur about once in 7,000 years. Over the expected life of the plant, that means that the risk of such an event was extremely low). This plant was relatively new and had many safeguards and backup systems to prevent a release of this toxic chemical into the air. Scientists were, in fact, surprised that a toxic chemical emission of this size could take place.

Because the leak was discovered quickly and the release stopped, a relatively small quantity of the chemical was emitted. The emission of the gas and its rapid dispersion across the community took place so quickly that no warning was given to community residents within the first several minutes.

The emission of the toxic gas cloud caused 9 deaths, 78 injuries that needed medical treatment, and hundreds of other minor injuries. Almost 200 families (about 1,000 people) evacuated from the community for several hours to several days until they could be assured that their homes were safe.

Long-term health consequences to the population were unknown in the weeks following the event. Although many people had not immediately sought treatment for respiratory ailments, health complaints continued to be reported for some weeks following the event. Sometimes the health problems associated with exposure to this gas do not show up for several months.

In addition to the public health concerns, this was an expensive chemical event in terms of economic losses. Economic losses in agriculture and tourism would be about $200 million during the 24 months following the event.

City officials estimated that it would take Santa Louisa at least two years to recover from this chemical event.

INSTRUCTIONS: ANSWER THE FOLLOWING QUESTIONS <u>BEFORE</u> CONTINUING ON TO THE NEXT SECTION.

10. Given what you now know about the physical nature of this toxic gas emission, how severe do you think the consequences of it were for the community?

NOT AT ALL SEVERE									VERY SEVERE
1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

11. Which of the following parties, if any, is responsible for various ways of compensating victims or ways of recovering from the earthquake? Please circle the number that best reflects your beliefs about the responsibility of each of the parties for each item specified. A "1" indicates no responsibility; a "10" means high responsibility.

A. Compensation for deaths and health problems due to the chemical emission.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Owners of this chemical plant	1	2	3	4	5	6	7	8	9	10
Operators of this chemical plant	1	2	3	4	5	6	7	8	9	10
Other business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

B. Continuing to monitor residents of the community to determine whether delayed health problems are occurring.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Owners of this chemical plant	1	2	3	4	5	6	7	8	9	10
Operators of this chemical plant	1	2	3	4	5	6	7	8	9	10
Other business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

C. Determining where soils and water were contaminated by the chemical.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Owners of this chemical plant	1	2	3	4	5	6	7	8	9	10
Operators of this chemical plant	1	2	3	4	5	6	7	8	9	10
Other business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

D. Cleaning up the soils and water that were contaminated by the chemical.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Owners of this chemical plant	1	2	3	4	5	6	7	8	9	10
Operators of this chemical plant	1	2	3	4	5	6	7	8	9	10
Other business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

E. Assistance to help community businesses and agriculture recover.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Owners of this chemical plant	1	2	3	4	5	6	7	8	9	10
Operators of this chemical plant	1	2	3	4	5	6	7	8	9	10
Other business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

F. Restoration of <u>public</u> property (for example, the prison's agricultural land and the University's and other schools' athletic fields).

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Owners of this chemical plant	1	2	3	4	5	6	7	8	9	10
Operators of this chemical plant	1	2	3	4	5	6	7	8	9	10
Other business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

G. Restoration of any private property damaged by the chemical emission.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Owners of this chemical plant	1	2	3	4	5	6	7	8	9	10
Operators of this chemical plant	1	2	3	4	5	6	7	8	9	10
Other business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

12. Any additional comments about who is responsible for helping Santa Louisa recover from the earthquake, or what people should do:

____

____

____

THAT COMPLETES OUR STUDY. THANK YOU FOR PARTICIPATING!!

D
Class

APPENDIX 1

EXPERIMENT 2

SCENARIO: TECHNOLOGICAL DISASTER--SEVERE CONSEQUENCES

UNIVERSITY OF DELAWARE COMMUNITY PERCEPTION STUDY

CERTIFICATE OF INFORMED CONSENT

The purpose and nature of this study has been explained to me. I understand that I will be reading a description of a community and events that take place in it and making some individual judgments about those happenings.

I understand that my participation in this study will have no bearing on my grade in this course, except that I will receive 5 points extra credit for my participation.

I have been informed that all of my responses will remain confidential and that my participation in this study will be anonymous.

I voluntarily agree to participate in this research project.

NAME: (PLEASE PRINT) ______________________________

SIGNATURE: ______________________________

DATE: ______________________

DESCRIPTION OF SANTA LOUISA

The city of Santa Louisa is an older, but growing community located about 5 miles inland on California's central coast, midway between Santa Cruz to the north and Santa Barbara to the south. The city was originally established as one of California's early missions by Father Junipero Serra in 1712, and lies at the bottom of a small, lush valley. The community remained a small farming community until the early 1920's when vacationers along the nearby coast started moving to the area for its small town way of life and healthy climate.

The city was finally incorporated in 1930 and established its first city government. The city center quickly expanded around the old mission district to about eight square blocks with 2 to 6 story buildings constituting the downtown area.

Following World War II, the community became a desirable place to build new light industry because there was sufficient available land around the city center to build the new facilities that would house these modern technologies. As a result, many people moved into the area during the 1950's and 1960's to take jobs in these new plants. As a result, several new housing developments sprang up around the city center.

One of Santa Louisa's main industries remains farming; the area around the city is particularly well-known for its peaches and nectarines. In the hills around Santa Louisa, many well-established vineyards are located. The Santa Susana Valley is second only to the Napa Valley in producing exceptional California wines.

Due to the growing population in this general area of the California coast during the 1960's, the California State University system established a new campus in Santa Louisa in 1969 on the outskirts of the residential areas. The campus was primarily for undergraduate liberal arts and business majors. However, a new prestigious College of Architecture was established to draw both undergraduates and graduate students from throughout the state to this campus.

In the 1970's, the state's Department of Corrections built a medium security prison in the countryside around Santa Louisa. The prison population, now numbering around 4,000, works by farming the 400 acres around the prison.

Today, the central business district in the downtown area consists of local and county government office buildings (Santa Louisa is also the county seat of Santa Susana County), established retail stores, professional office buildings (for doctors, lawyers, and accountants), and many service businesses. While many buildings are modern--having been built since the 1960's--there are also many older and historical structures in the downtown area that date to the mid-1800's. The housing developments surrounding the city center are now "mature" areas with established schools, stores, and small shopping centers. Newer more expensive residential developments are still being built farther from the city center. Interspersed between these residential areas are the manufacturing and high tech plants and business parks that employ many of the city's residents. The population in the 1990 census was 98,765. The University student population adds another 7,500 people who are in the community for at least 9 months each year.

In general, the community has retained its reputation for being a "nice place to live" with its low rate of unemployment, expanding high tech industries, good climate, and clean environment.

INSTRUCTIONS: ANSWER THE FOLLOWING QUESTION <u>BEFORE</u> CONTINUING ON TO THE NEXT SECTION.

1. From what you now know about Santa Louisa, how would you assess the quality of life its residents experience? Please circle the number in the following scale that best represents your assessment--a "1" means a very poor quality of life and a "10" means a wonderful quality of life.

VERY POOR — WONDERFUL

1 2 3 4 5 6 7 8 9 10

GO RIGHT ON TO THE NEXT PAGE.

MORE ABOUT SANTA LOUISA

The community of Santa Louisa had experienced several small earthquakes--that mostly just gently shook the city's inhabitants--over the past 20 years or so. Being in California's "earthquake belt," of course, meant that residents knew what consequences earthquakes had for other nearby small communities as well as for the larger urban areas in the state. For example, the Loma Prieta earthquake in October, 1989 killed 104 people, injured 3,400 others, caused the collapse of an elevated freeway, largely destroyed Santa Cruz's downtown district, and damaged many multi-storied buildings in the San Francisco Bay Area.

While the majority of residents knew that the Los Osos Fault existed near the city, it had never caused much concern among community residents for their safety.

City agencies (particularly the Police Department, the Fire Department, and the Emergency Management Office) have done some disaster response planning, covering a wide range of disasters that could happen in the city. This would enable them to work more effectively to lessen life loss if a disaster occurred in the city. However, city officials have not undertaken any actions that would improve the safety or safe operation of any of the buildings or facilities in the city, mainly because the city lacks the money to do so.

INSTRUCTIONS: ANSWER THE FOLLOWING QUESTIONS BEFORE CONTINUING ON TO THE NEXT SECTION.

2. Given their experience with earthquakes, how concerned do you think the residents of Santa Louisa should be about their safety? (CIRCLE ONE)

NOT CONCERNED AT ALL — VERY CONCERNED

1 2 3 4 5 6 7 8 9 10

GO RIGHT ON TO THE NEXT PAGE.

3. And what about the public officials? How concerned do you think they should be about the safety of the city's buildings and facilities? (CIRCLE ONE)

NOT CONCERNED AT ALL									VERY CONCERNED
1	2	3	4	5	6	7	8	9	10

4. If you were a resident of Santa Louisa, how concerned would you be about your safety because of the existence of the earthquake fault? (CIRCLE ONE)

NOT CONCERNED AT ALL									VERY CONCERNED
1	2	3	4	5	6	7	8	9	10

5. Given the history in Santa Louisa, and also what they know has happened elsewhere, what amount of action should residents of Santa Louisa take to prepare themselves and their families to deal with a future earthquake? (CIRCLE ONE)

NO NEW ACTION IS NEEDED									A GREAT DEAL OF ACTION
1	2	3	4	5	6	7	8	9	10

6. How much trust would you put in local agencies to be able to respond to a large earthquake that affected Santa Louisa? (CIRCLE ONE)

NO TRUST									A GREAT DEAL OF TRUST
1	2	3	4	5	6	7	8	9	10

7. From what you now know about Santa Louisa, how would you assess the quality of life of its residents?

VERY POOR									WONDERFUL
1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

8. Please circle how important you think it is that the following actions be taken in Santa Louisa.

A. Conduct a scientific assessment of the likelihood that a major earthquake could effect Santa Louisa.

NOT AT ALL IMPORTANT									VERY IMPORTANT
1	2	3	4	5	6	7	8	9	10

B. Conduct an assessment of how vulnerable the community would be if a major earthquake occurred (that is, how many buildings, systems, or structures are likely to fail).

NOT AT ALL IMPORTANT									VERY IMPORTANT
1	2	3	4	5	6	7	8	9	10

C. Designing and building new structures that are resistant to earthquakes.

NOT AT ALL IMPORTANT									VERY IMPORTANT
1	2	3	4	5	6	7	8	9	10

D. Requiring that older buildings be strengthened so they will not collapse in an earthquake.

NOT AT ALL IMPORTANT									VERY IMPORTANT
1	2	3	4	5	6	7	8	9	10

E. Educate the community about the risk of an earthquake and about what to do if an earthquake occurs.

NOT AT ALL IMPORTANT									VERY IMPORTANT
1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

F. Strengthen and enforce building codes and land use regulations that would reduce earthquake damage.

NOT AT ALL IMPORTANT									VERY IMPORTANT
1	2	3	4	5	6	7	8	9	10

G. Develop a warning system for earthquakes.

NOT AT ALL IMPORTANT									VERY IMPORTANT
1	2	3	4	5	6	7	8	9	10

H. Purchase earthquake insurance.

NOT AT ALL IMPORTANT									VERY IMPORTANT
1	2	3	4	5	6	7	8	9	10

9. Please indicate who, if anyone, is responsible for undertaking the following actions in Santa Louisa. Please circle the number that best reflects your beliefs about the responsibility of each of the parties for each action specified. A "1" indicates no responsibility; a "10" means high responsibility.

A. Conduct a scientific assessment of the likelihood that a major earthquake could effect Santa Louisa.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

B. Conduct an assessment of how vulnerable the community would be if a major earthquake occurred (that is, how many buildings, systems or structures are likely to fail).

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Businesses owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

C. Designing and building new structures that are resistant to earthquakes.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

D. Require that older buildings be strengthened so they will not collapse in an earthquake.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

E. Educate the community about the risk of an earthquake and about what to do if an earthquake occurs.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

F. Strengthen and enforce building codes and land use regulations that would reduce earthquake damage.

	NO RESP.								HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9 10
State government officials	1	2	3	4	5	6	7	8	9 10
Local government officials	1	2	3	4	5	6	7	8	9 10
Scientists	1	2	3	4	5	6	7	8	9 10
Architects and engineers	1	2	3	4	5	6	7	8	9 10
Builders and contractors	1	2	3	4	5	6	7	8	9 10
Business owners	1	2	3	4	5	6	7	8	9 10
Community residents	1	2	3	4	5	6	7	8	9 10

G. Develop a warning system for earthquakes.

	NO RESP.								HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9 10
State government officials	1	2	3	4	5	6	7	8	9 10
Local government officials	1	2	3	4	5	6	7	8	9 10
Scientists	1	2	3	4	5	6	7	8	9 10
Architects and engineers	1	2	3	4	5	6	7	8	9 10
Builders and contractors	1	2	3	4	5	6	7	8	9 10
Business owners	1	2	3	4	5	6	7	8	9 10
Community residents	1	2	3	4	5	6	7	8	9 10

GO RIGHT ON TO THE NEXT PAGE.

H. Purchase earthquake insurance.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

AFTER YOU HAVE ANSWERED THESE QUESTIONS, GO ON TO THE NEXT SECTION.

AN EVENT IN SANTA LOUISA

At 10:05 on a Wednesday morning in November, 1992, a 7.9 earthquake rocked the city of Santa Louisa and its surrounding suburbs. The earthquake resulted from the movement on a known fault--the Los Osos Fault--that had not been active recently. The fault is about 3 miles from the city center, just beyond the city limits.

The initial earthquake shock shook the ground for over 50 seconds, a relatively long time for an earthquake in this area. The earth then continued to vibrate for several minutes following the quake's major shock.

Because the soils underneath the city are uncompacted alluvial sediments, the earthquake caused all areas of the city to experience extreme and prolonged shaking. The damages and losses from the earthquake occurred throughout the city--in its downtown center as well as its surrounding residential and business park areas. However, few other nearby communities sustained any major damage or losses from this earthquake event.

The earthquake was not predicted. Scientists had mapped the fault and determined that it was "active" (in geologic terms, which means that the fault has moved within the last 7,000 years). It was believed that an earthquake of this magnitude was very unlikely in the near future. Scientists know, however, that an earthquake can occur at any time on an active fault.

Because the event was not predicted, residents of the area had no warning that an event was imminent or even very likely to occur. Scientists were, in fact, surprised that the fault was capable of producing an earthquake of this magnitude.

The earthquake caused 89 deaths, 450 injuries that needed medical treatment, and thousands of other minor injuries. Almost 4,000 families (26,000 people) evacuated their homes for several hours to several days until they could be assured that their homes were safe.

This was an extremely expensive earthquake in terms of economic losses. It was estimated that damage to structures would cost almost $1 billion to repair. Economic losses to businesses--due to damage to their buildings, loss of utilities, loss of production and office equipment, loss of customers, and loss of inventories and stock--soared to over $2 billion during the 24 months following the earthquake.

City officials estimated that it would take Santa Louisa at least a decade to recover from this earthquake, if it ever really did.

INSTRUCTIONS: ANSWER THE FOLLOWING QUESTIONS BEFORE CONTINUING ON TO THE NEXT SECTION.

10. Given what you now know about the physical nature of the earthquake, how severe do you think the consequences of it were for the community?

NOT AT ALL SEVERE									VERY SEVERE
1	2	3	4	5	6	7	8	9	10

11. Which of the following parties, if any, is responsible for various ways of compensating victims or ways of recovering from the earthquake? Please circle the number that best reflects your beliefs about the responsibility of each of the parties for each item specified. A "1" indicates no responsibility; a "10" means high responsibility.

    A. Compensation for deaths and personal injuries due to the earthquake.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Local businesses	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

B. Assistance to help businesses recover.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

C. Restoration of ruined public buildings, including schools, the prison, and City Hall.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

D. Restoration of the Mission.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

E. Restoration of damaged or destroyed private homes.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

F. Restoration of damaged or destroyed rental houses or apartment buildings.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

G. Removal and clean-up of earthquake-caused debris.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

12. Any additional comments about who is responsible for helping Santa Louisa recover from the earthquake, or what people should do:

____

____

____

THAT COMPLETES OUR STUDY. THANK YOU FOR PARTICIPATING!!

A
Class

APPENDIX 1

EXPERIMENT 3

SCENARIO: FLOOD DISASTER--DAM FAILURE

UNIVERSITY OF DELAWARE COMMUNITY PERCEPTION STUDY

CERTIFICATE OF INFORMED CONSENT

The purpose and nature of this study has been explained to me. I understand that I will be reading a description of a community and events that take place in it and making some individual judgments about those happenings.

I understand that my participation in this study will have no bearing on my grade in this course, except that I will receive 5 points extra credit for my participation.

I have been informed that all of my responses will remain confidential and that my participation in this study will be anonymous. I understand that this sheet will be detached from the questionnaire so there is no way to identify my responses.

I voluntarily agree to participate in this research project.

NAME: (PLEASE PRINT) ____________________________________

SIGNATURE: ____

DATE: ______________________________

DESCRIPTION OF SANTA LOUISA

The city of Santa Louisa is an older, but growing community located about 5 miles inland on California's central coast, midway between Santa Cruz to the north and Santa Barbara to the south. The city was originally established as one of California's early missions by Father Junipero Serra in 1712, and lies at the bottom of a small, lush valley. The community remained a small farming community until the early 1920's when vacationers along the nearby coast started moving to the area for its small town way of life and healthy climate.

The city was finally incorporated in 1930 and established its first city government. The city center quickly expanded around the old mission district to about eight square blocks with 2 to 6 story buildings constituting the downtown area.

Following World War II, the community became a desirable place to build new light industry because there was sufficient available land around the city center to build the new facilities that would house these modern technologies. As a result, many people moved into the area during the 1950's and 1960's to take jobs in these new plants. As a result, several new housing developments sprang up around the city center.

One of Santa Louisa's main industries remains farming; the area around the city is particularly well-known for its peaches and nectarines. In the hills around Santa Louisa, many well-established vineyards are located. The Santa Susana Valley is second only to the Napa Valley in producing exceptional California wines.

Due to the growing population in this general area of the California coast during the 1960's, the California State University system established a new campus in Santa Louisa in 1969 on the outskirts of the residential areas. The campus was primarily for undergraduate liberal arts and business majors. However, a new prestigious College of Architecture was established to draw both undergraduates and graduate students from throughout the state to this campus.

In the 1970's, the state's Department of Corrections built a medium security prison in the countryside around Santa Louisa. The prison population, now numbering around 4,000, works by farming the 400 acres around the prison.

Today, the central business district in the downtown area consists of local and county government office buildings (Santa Louisa is also the county seat of Santa Susana County), established retail stores, professional office buildings (for doctors, lawyers, and accountants), and many service businesses. While many buildings are modern--having been built since the 1960's--there are also many older and historical structures in the downtown area that date to the mid-1800's. The housing developments surrounding the city center are now "mature" areas with established schools, stores, and small shopping centers. Newer more expensive residential developments are still being built farther from the city center. Interspersed between these residential areas are the manufacturing and high tech plants and business parks that employ many of the city's residents. The population in the 1990 census was 98,765. The University student population adds another 7,500 people who are in the community for at least 9 months each year.

In general, the community has retained its reputation for being a "nice place to live" with its low rate of unemployment, expanding high tech industries, good climate, and clean environment.

INSTRUCTIONS: ANSWER THE FOLLOWING QUESTION BEFORE CONTINUING ON TO THE NEXT SECTION.

1. From what you now know about Santa Louisa, how would you assess the quality of life its residents experience? Please circle the number in the following scale that best represents your assessment--a "1" means a very poor quality of life and a "10" means a wonderful quality of life.

VERY POOR									WONDERFUL
1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

MORE ABOUT SANTA LOUISA

The community of Santa Louisa had experienced several floods since the community was first established. Most were small, flooding low-lying farmlands near the Santa Susana River. However, there have also been very large floods during the past 100 years that caused extensive damage to the entire Santa Susana Valley. After one particularly devastating flood in 1951 that swept through the city of Santa Louisa causing a millions of dollars of damage and killing 5 people, a dam was built on the Santa Susana River by the State of California to provide both flood protection for the growing number of residents living downstream and water for the agricultural areas in the Valley. Since the dam was built, only minor flooding events have taken place.

In 1975, when the Teton Dam failed in Idaho, washing away three communities downstream and killing over 120 people, some concern was raised about the structural integrity of the Santa Susana River Dam. Computer analysis was conducted to determine whether the dam could withstand a "maximum design flood" (that is, the largest flood that could take place on the watershed above the dam). It was found that the dam had some weaknesses near the top of the structure that could weaken the dam under such flood conditions. As a result, the state put the dam on its list on dams to be strengthened; however, as of today only minor repairs have been made since money for "non-critical" dams has not been available from the state.

While the majority of residents know about the floods that had occurred around the city, it had never caused much concern among community residents for their current safety.

City agencies (particularly the Police Department, the Fire Department, and the Emergency Management Office) have done some disaster response planning, covering a wide range of disasters that could happen in the city. This would enable them to work more effectively to lessen life loss if a disaster occurred in the city. However, city officials have not undertaken any actions that would improve the safety of any of the buildings, facilities, or residences in the city, mainly because the city lacks the money to do so. They do acknowledge, however, that since much of the city is in a 500-year flood zone, they could experience a repeat of the 1951 flood.

INSTRUCTIONS: ANSWER THE FOLLOWING QUESTIONS BEFORE CONTINUING ON TO THE NEXT SECTION.

2. Given their experience with flooding, how concerned do you think the residents of Santa Louisa should be about their safety? (CIRCLE ONE)

NOT CONCERNED AT ALL									VERY CONCERNED
1	2	3	4	5	6	7	8	9	10

3. And what about the public officials? How concerned do you think they should be about the safety of the city's buildings and inhabitants? (CIRCLE ONE)

NOT CONCERNED AT ALL									VERY CONCERNED
1	2	3	4	5	6	7	8	9	10

4. If you were a resident of Santa Louisa, how concerned would you be about your safety because of the past history of the city with flooding on the Santa Susana River? (CIRCLE ONE)

NOT CONCERNED AT ALL									VERY CONCERNED
1	2	3	4	5	6	7	8	9	10

5. Why would you have this level of concern?

____
____
____
____

6. Given the history in Santa Louisa, and also what they know has happened elsewhere, what amount of action should residents of Santa Louisa take to prepare themselves and their families to deal with a future flood? (CIRCLE ONE)

NO NEW ACTION IS NEEDED									A GREAT DEAL OF ACTION
1	2	3	4	5	6	7	8	9	10

7. How much trust would you put in city or county agencies to be able to respond to a large flood that affected Santa Louisa? (CIRCLE ONE)

NO TRUST — A GREAT DEAL OF TRUST

1 2 3 4 5 6 7 8 9 10

8. How much trust would you put in state agencies to be able to respond to a large flood that affected Santa Louisa? (CIRCLE ONE)

NO TRUST — A GREAT DEAL OF TRUST

1 2 3 4 5 6 7 8 9 10

9. From what you now know about Santa Louisa, how would you assess the quality of life of its residents?

VERY POOR — WONDERFUL

1 2 3 4 5 6 7 8 9 10

10. Please circle how important you think it is that the following actions be taken in Santa Louisa.

A. Conduct a new scientific assessment of the likelihood that a maximum damaging flood could occur in the Santa Susana Valley.

NOT AT ALL IMPORTANT — VERY IMPORTANT

1 2 3 4 5 6 7 8 9 10

B. Conduct an assessment of how vulnerable the community would be if such a flood occurred (that is, how many buildings, systems, or structures are likely to be severely damaged or washed away).

NOT AT ALL IMPORTANT — VERY IMPORTANT

1 2 3 4 5 6 7 8 9 10

C. Designing and building new structures that are flood resistant.

NOT AT ALL IMPORTANT | | | | | | | | | VERY IMPORTANT

1 2 3 4 5 6 7 8 9 10

D. Requiring that older buildings be strengthened or relocated so they will not be washed away by a flood.

NOT AT ALL IMPORTANT | | | | | | | | | VERY IMPORTANT

1 2 3 4 5 6 7 8 9 10

E. Educating the community about the risk of large floods and about what to do if a flood occurs.

NOT AT ALL IMPORTANT | | | | | | | | | VERY IMPORTANT

1 2 3 4 5 6 7 8 9 10

F. Strengthening and enforcing building codes and land use regulations that would reduce flood damage.

NOT AT ALL IMPORTANT | | | | | | | | | VERY IMPORTANT

1 2 3 4 5 6 7 8 9 10

G. Condemning structures that are obviously in danger of being destroyed (that is, structures that are in low-lying areas adjacent to the river) to reduce both life and property loss.

NOT AT ALL IMPORTANT | | | | | | | | | VERY IMPORTANT

1 2 3 4 5 6 7 8 9 10

H. Developing a warning system for floods so people could evacuate if their homes were threatened by rising water.

NOT AT ALL IMPORTANT									VERY IMPORTANT
1	2	3	4	5	6	7	8	9	10

I. Purchasing flood insurance.

NOT AT ALL IMPORTANT									VERY IMPORTANT
1	2	3	4	5	6	7	8	9	10

11. Please indicate who, if anyone, is responsible for undertaking the following actions in Santa Louisa. Please circle the number that best reflects your beliefs about the responsibility of each of the parties for each action and each actor specified. A "1" indicates no responsibility; a "10" means high responsibility.

A. Conduct a new scientific assessment of the likelihood that a maximum damaging flood could occur in the Santa Susana Valley.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

B. Conduct an assessment of how vulnerable the community would be if such a flood occurred (that is, how many buildings, systems or structures are likely to be severely damaged or washed away).

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Businesses owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

C. Designing and building new structures that are flood resistant.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

D. Requiring that older buildings be strengthened or relocated so they will not be washed wawy by a flood.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

E. Educating the community about the risk of large floods and about what to do if a flood occurs.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

F. Strengthening and enforcing building codes and land use regulations that would reduce flood damage.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

G. Condemning structures that are ovbiously in danger of being destroyed (that is, structures that are in low-lying areas adjacent to the river) to reduce both life and property loss.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

H. Developing a warning system for floods so people could evacuate if their homes were threatened by rising water.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

I. Purchasing flood insurance.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

AFTER YOU HAVE ANSWERED THESE QUESTIONS, GO ON TO THE NEXT SECTION.

AN EVENT IN SANTA LOUISA

By the third week in November, 1992, it had been raining fairly steadily in the mountains surrounding Santa Louisa for three weeks. The ground was saturated and could absorb no more water. The lake behind the Santa Susana River Dam had reached flood stage two days earlier; and the operators of the dam (employees of the State of California) had been letting as much water as possible out of the lake to reduce flooding behind the dam and to lessen the physical stress of the excessive water on the dam itself.

With the assistance of city workers and civilian volunteers, efforts were being made to build up levees around Santa Louisa to keep flood waters out of the city and away from populated areas. Residents near the river began moving furniture to upper floors of their homes; and some of those residents who lived next to the river actually began to remove some of their household goods to areas farther from the river.

Although the Weather Service began reporting on the developing rain conditions in early November and updating them on a daily basis, the forecasters could not predict the amount of rain that would fall within the next 24 hour period. However, projections of when the river could begin to reach flood stage and start to overflow its banks were being made.

The Santa Susana River Dam began to fail on a Wednesday morning at 10:05 a.m. in late November. The dam's operators had been monitoring the dam during the rain period, but they did not anticipate that the dam would fail. The dam sprung a giant leak near the top of its spillway; and as water continued to pour through the hole, it enlarged. Within less than 30 minutes, the water from behind the dam was on the way toward Santa Louisa.

When the forward surge of the dam-released water reached Santa Louisa, it flooded over the banks of the river, covering a significant portion of Santa Louisa with water. Flooding caused about a dozen deaths, and 450 or so injuries that needed medical treatment, and thousands of other minor injuries. Almost 4,000 families in Santa Louisa had to evacuate their homes, most for several days to weeks, until the flood waters receded and they could begin to clean up.

This was an extremely expensive flood in terms of economic losses. It was estimated that damage to structures would cost almost $1 billion to repair. Economic losses to businesses--due to damage to their buildings, loss of utilities, loss of production and office equipment, loss of customers, and loss of inventories and stocks--soared to over $2 billion during the 12 months following the flood. Also, over $500 million of agricultural crops and livestock, farm machinery, and farm buildings were destroyed by the flood.

City officials estimated that it would take Santa Louisa at least a decade to recover from this earthquake, if it ever really did.

INSTRUCTIONS: ANSWER THE FOLLOWING QUESTIONS <u>BEFORE</u> CONTINUING ON TO THE NEXT SECTION.

12. Given what you now know about the physical nature of the flood, how severe do you think the consequences of it were for the community?

NOT AT ALL SEVERE									VERY SEVERE
1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE

13. Which of the following parties, if any, is responsible for various ways of compensating victims or ways of recovering from the flood? Please circle the number that best reflects your beliefs about the responsibility of each of the parties for each item specified. A "1" indicates no responsibility; a "10" means high responsibility.

A. Compensation for deaths and personal injuries due to the flood.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Local businesses	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE

B. Assistance to help businesses recover.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

C. Restoration of ruined public buildings, including schools, the prison, and City Hall.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

D. Restoration of the Mission.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

E. Restoration of damaged or destroyed private homes.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

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F. Restoration of damaged or destroyed rental houses or apartment buildings.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

G. Removal and clean-up of flood-caused debris.

	NO RESP.									HIGH RESP.
Federal government officials	1	2	3	4	5	6	7	8	9	10
State government officials	1	2	3	4	5	6	7	8	9	10
Local government officials	1	2	3	4	5	6	7	8	9	10
Scientists	1	2	3	4	5	6	7	8	9	10
Architects and engineers	1	2	3	4	5	6	7	8	9	10
Builders and contractors	1	2	3	4	5	6	7	8	9	10
Business owners	1	2	3	4	5	6	7	8	9	10
Community residents	1	2	3	4	5	6	7	8	9	10

GO RIGHT ON TO THE NEXT PAGE.

14. Any additional comments about who is responsible for helping Santa Louisa recover from the flood, or what people should do:

____

____

____

THAT COMPLETES OUR STUDY. THANK YOU FOR PARTICIPATING!!

B
Class