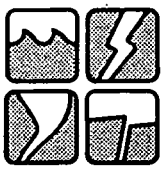

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PUBLIC IMAGES ABOUT CHLORINE STORAGE HAZARDS FOLLOWING AN ACCIDENTAL GAS RELEASE

George Cvetkovich

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Quick Response Research Report #22

PUBLIC IMAGES ABOUT CHLORINE STORAGE HAZARDS FOLLOWING AN ACCIDENTAL GAS RELEASE

Final Report*
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PUBLIC IMAGES ABOUT CHLORINE STORAGE HAZARDS FOLLOWING AN ACCIDENTAL GAS RELEASE

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PUBLIC IMAGES ABOUT CHLORINE STORAGE HAZARDS FOLLOWING AN ACCIDENTAL GAS RELEASE

ABSTRACT

This study is guided by two research questions: 1) What changes, if any, occur in the characteristics of hazard images as a result of an industrial accident? 2) How are characteristics of hazard images related to judgments about the hazard? In answer to the second question, examination of citizen responses to a local chlorine storage facility following an accidental gas release indicate that image vividness is influenced by personal experiences and that image characteristics are correlated to hazard judgments. The answer to the first question seems to depend on existing mental models about a hazard and its management. In a case such as the one studied, where citizens have concluded that an adequate community management repertoire exists, an accident induces a state of vigilance rather than acting as a signal for an emergency response.

1. INTRODUCTION

The present study capitalized on the occurrence of an accidental gas release to investigate images held by the public concerning the hazard of chlorine gas storage. Two questions guided the research: 1) What changes, if any, occur in the characteristics of hazard images as a result of an accidental gas release? Three image characteristics were investigated: availability of the image (i.e., the ease of generating a hazard image from memory), the concreteness of the image and the emotional impact of the image. 2) How are characteristics of hazard images related to judgments about the hazard? Hazard judgments investigated included the acceptance of the hazard within the community, the personal concern generated by the hazard, expectations of the occurrence of future releases and injuries and trust in hazard management and control?

1.1. The concept of hazard image

An image is a cognitive representation, a concept or an idea, potentially containing both abstract and concrete impressions; it is a mental picture, but not necessarily a visual one, which is often accompanied by an emotional reaction (Fiske, Pratto & Pavelchak, 1983). Mental images are generated on the basis of mental models held by an individual that are relevant to a particular phenomena such as a hazard. For example, most people's mental model of jet airplanes includes the element that they carry highly explosive fuel. Because of this, when asked to describe an image of a plane crashing into a hillside, many individuals might be expected to report that their image includes a fire or an explosion. If asked to imagine the crash of a glider, the generated image is less likely to include an explosion or fire since a mental model of an engineless aircraft does not include the presence of a highly inflammable substance.

1.2. Images, judgments and actions

Affect-laden images have been shown to be predictors of voting for particular political candidates (Campbell, Converse, Miller & Stokes, 1960) and discrimination and prejudicial behaviors (Hamilton, 1981). With regard to other behaviors, images have been conceptualized as consisting only of cognitive representations. But in these areas images also have been shown to have behavioral consequences. Extensive research in environmental psychology and geography has investigated how personal experience such as frequency of use influences representations of spatial relationships in cognitive maps (e.g., Golledge, 1986) and the affective and behavioral consequences of these images. Similarly, urban planners following the seminal work of Kevin Lynch (1960), have talked about the urban features that make the images of particular cityscapes memorable and the areas preferable. These varied initial forays suggest the usefulness of the concept of hazard images for understanding hazard-related behavior.

Beach and Mitchell (1988) have argued that judgments are made and actions guided on the basis of comparing images of specific goals, ideal outcomes, plans and anticipated outcomes. Taking a similar line of arguement, Markus and Nurius (1986) propose that images of what one would like to be, will possibly be and wish to avoid being influence decisions for coping with the present. Hazard images, therefore, should be predictive of judgments about the likelihood and severity of accidents and other undesirable outcomes, as well as indicators of likely hazard-related coping actions.

1.3. Hazard images

With two exceptions (Fiske, Pratto & Pavelchak, 1983; Cvetkovich & Earle, 1988), we know of no research which has systematically investigated hazard images. Both of the existing studies invesitgated characterisitics of image vividness. In these studies "vividness" is composed of several dimensions. One dimension is image availability, the ease with which an image comes to mind. Availability has been identified with assessments of probability -- more readily available images are associated with higher estimations of occurrence (Tversky & Khaneman, 1974). Another dimension is image concreteness. Vivid images include elements having a specific direct sensory character. Concrete elements can be distinguished from abstract or general image elements. Elements such as "buildings on fire," "screams," and "take cover" are concrete elements. Statements such as "utter destruction," "chaos," and "all the beautiful things in the world gone" are defined as abstract elements. Some theorists define vividness to include affective response (Nisbett & Ross, 1980). Fiske, Pratto and Pavelchak argue that images should be defined as cognitive representation that <u>may</u> have emotional impact -- the characteristics of availability, concreteness and emotional response should be conceived of as separate dimensions, a suggestion that is followed in the present study.

In the first telephone survey of hazard images Fiske, et

al. found that the number of concrete elements in an image was predictive of political behaviors. The images of anti-nuclear activists contained more concrete elements than did the images of non-activists. While the American public holds readily available (abstract) images of nuclear holocaust and experiences a negative emotional response to the issue of nuclear war, Fiske (1987) argues that most people are not moved to take political action because they lack appropriate concrete images.

Utilizing a methodology similar to that of Fiske, et al., Cvetkovich and Earle (1988) investigated citizen images of a proposed toxic waste incineration plan. Concreteness of image was found to be indirectly related to political activity. Individuals holding concrete hazard images took the action of attending citizen meetings about the incineration plan only if their images did not have a relatively high number of abstract image elements. This particular pattern of relationships might be accounted for by the newness of the issue of toxic incineration in the the United States in general and the studied community in particular. Unlike public discussion of the nuclear holocaust issue, public discussion of toxic waste incineration has only begun. Continued discussion is likely to produced increased availability of concrete image elements and a decrease of abstract elements. Abstract image elements may inhibit the taking of activity concerning the hazard. Thus, in the future, if public discussion of toxic waste incineration continues, the pattern of relationships between image vividness and behavior should become similar to that found for the nuclear holocaust issue by Fiske, Pratto, & Pavelchak, i.e., image concreteness will be directly and positively related to hazard-related actions.

1.4. Hazard image changes and the signal value of industrial accidents

Given the apparent relationship of images to judgments and actions related to hazard adaptation it is important to learn how images operate and change in a variety of circumstances. A particularly important question relative to emergency response preparation and public communication is how do images and concomitant judgments change following an industrial accident. One possiblity is that accidents have a direct, straightforward effects on images. If a person directly experiences an accident, or receives a graphic description of it, his/her image changes by directly incorporating concrete information from the experience. Thus, this line of arguement predicts that hazard images willbecome mor vivid following an industrial accident. This, however, is probably too simple of an expectation in that it assumes too passive of a role for the information receiver.

An alternative expectation is based on the assumption that active interpretation of information about an accident will occur. The major key points of this expectation are that:

1. Images are generated utilizing existing mental models (i.e., organized ways of thinking about a hazard).

2. New elements (e.g.,information from an accident) will be in-

corporated into an image to the extent that they fit existing mental models.

3. Mental models about hazardous industrial facilities may include not only thinking about how the facility operates but also thinking about management and safety procedures both within the plant and in the surrounding community.

Thus, this interpretation leads to the conclusion that the signal value (Slovic, 1987) of an accident, that is, its usefulness in portending future problems, is affected by more than the concrete sensory information received. The supposed reason for the accident, the nature of responses to the accident, the judged effectiveness of hazard management, moves to reduce the likelihood of future accidents and other "context" information will play a part in determining the judged significance of the accident and its influence on generated hazard images. This supposition leads to the expectation that under some circumstances the experience of an industrial accident will not increase the vividness of hazard images. Such is expected to be the case when people's mental models suggest that the processes relating to a hazard are well known and that the hazard is being managed so as to minimize the potential for catastrophy (Slovic, 1987). Under these circumstances an accident will assume a low value as a signal of future problems and will not induce more vivid hazard images.

2. IMAGES AND JUDGMENTS OF CHLORINE STORAGE HAZARD: THE PRE-RELEASE STUDY

The Cvetkovich and Earle (1988) telephone survey of toxic waste incineration hazard images was conducted in November, 1986 at the height of public controversy over this issue. An existing chlorine storage facility was selected as a comparison hazard. The chlorine facility, part of a pulp-processing plant operated by the Georgia Pacific Corporation, has been located near the main business district of Bellingham, WA for nearly forty years. It made an interesting comparison to the toxic waste incineration plan because: a) it was not the focus of widespread media attention at the time that the toxic waste incineration plan was being debated; and b) it did not inspire public outcry or political activity.

Study participants consisted of a sample of 207 individuals randomly selected from the Bellingham, WA telephone directory. This number represents eighty-two percent of those contacted. People who were interviewed were asked questions first about the toxic waste incineration plans and then about the chlorine plant. In both cases, only participants who reported that they were aware of the activity were used in the respective analyses.

Comparisons of the obtained image characteristics and judgments for the two hazards show that respondents spent more time thinking about the toxic waste incineration plan than about the chlorine facility. Images of waste incineration were more readily available and less abstract than were images of the chlorine facility. There was no difference found in the concreteness of the images nor in their emotional impact. Respon-

dents were more concerned about the incineration plan and expressed less trust.that it would be safely managed.

3. IMAGES AND JUDGMENTS OF CHLORINE STORAGE HAZARD: THE POST-RELEASE STUDY

3.1. The accidental gas release and its aftermath

On the afternoon of October 19, 1987, almost one year after the completion of the above described study, overheated chlorine gas ate its way through a pipe in a heating system, causing a discharge of ferric chloride from the Georgia Pacific Corporation facility. Acting under the assumption that the large yellowish-green cloud slowly being blown through the main downtown area might contain deadly chlorine, emergency officials cordoned off the area and executed a partial evacuation. Several individuals were hospitalized as a result of lung and throat irritations from exposure to the chloride.

Since the affected geographic area, which is approximately at sea-level, is surrounded by higher-elevation areas, the cloud was clearly visible from many sections of the city. During the period of the cloud's movement through the town, verbal descriptions of it and its possible dangers were broadcast on local radio. Visual representations of the release in the form of photos, schematics and maps, as well as verbal descriptions, were also presented in the local newspaper and in television coverage by both local and regional stations. A large proportion of the local population saw the cloud directly or were exposed to one or more graphic and/or verbal descriptions of it either at the time of the release or within 24 hours afterwards.

In addition to being exposed to the actuality or a description of the gas release the public was also exposed to information about the causes of the release, responses to it, evaluation of present and future safety and facility management, and adequacy of emergency responses. There were several sources of this information reported in the media. Statements about events progressing during the release and the decision to evacuate were made by the director and other local emergency services personnel. The basic message given by these individuals concerned the difficulty of making emergency response decisions given uncertainities such as the cause and composition of the release but, nevertheless, that the response seemed to be appropriate to the hazard. Another chief source of information was the manager of the chlorine plant. His basic message, delivered in a somewhat combative manner in the weeks following the release, suggested that people should not over-react to the release. The arguement presented was that the community was not placed in grave danger by the release (chloride, not chlorine, had been released); that the risks of the siting of a chlorine plant in the business area is justified since chlorine is found in many other places besides the facility and that chlorine provides so many benefits (e.g., "Chlorine is a basic building block of society and it's going to be with us." "(Its) so bloody useful that its really all over the community." i.e., water supply, sewer treatment, manufacturing of plastics)(Stark, 1987). Needless to say this "message" was not welcomed by some citizens con-

cerned about future safety of the plant. These concerns seemed to be supported by chlorine facility workers who publicly complained about how they were notified about the release and evacuated from the plant (i.e., into the potential path of the gas cloud) and that safety procedures were not being enforced and followed. As a result of the release, and as part of Superfund Amendments and Reauthorization Act - Title III related activities, appraisals of emergency response plans and changes in the community warning system did take place. There was no organized citizen effort expressing apprehension about the facility and overt public expressions of concern rapidly diminished.

3.2. Survey sample

The post-release survey of chlorine storage hazard images was conducted from 17 to 19 November 1987, one month after the accidental gas release. The sample studied consisted of two groups: 1) Eighty-five individuals who had participated in the first study and who had agreed at both times to be reinterviewed and 2) Two hundred and twenty individuals who were contacted for the first time to participate in the post-release study. As was true of the pre-release survey, this second group was randomly selected from the local telephone directory. The response rates for the two sub-groups are 78% and 56%, respectively. Characteristics of the two subgroups of the post-release sample in comparison to the pre-release sample are shown in Table 1. The two total samples are fairly comparable with the exception that the post-release sample contains fewer long time residents. The reinterview sub-group is for the most part similar to the two total samples except that it contains somewhat fewer males, new residents, and 26 to 39 year olds, but more 40 to 45 year olds.

Table 1. Descriptive characteristics of samples.

		Pre-release sample (n = 207)	Post-release sample re-interview (n = 87)	Post-release sample total sample (n = 305)
Sex	male	44%	38%	44%
	female	56%	62%	56%
Age	18 to 25	24.0%	21.2%	21.1%
	26 to 39	33.5%	25.8%	34.8%
	40 to 65	30.0%	36.4%	29.1%
	66 or older	12.5%	16.7%	15.1%
Length residence	3 yrs or less	26.6%	15.2%	22.3%
	26 yrs or more	31.0%	39.4%	24.9%
Education	High school or less	28.2%	28.8%	24.1%

The expectation that a large proportion of the population was exposed either directly to the gas release or indirectly to information about it is supported by the results presented in Table 2. Over a third of the total sample had personally seen the

gas cloud and nearly everyone had received information from both formal and informal sources. Seven percent of the sample had been evacuated and nearly eleven percent reported having personally experienced some physical effect of the release such as burning eyes or throat.

Table 2. Percent of total post-release sample seeing release cloud and receiving information about it from media and friends (n=305).

Personally saw gas cloud	39.0 %
Received media information	89.3 %
Talked to friends about accident	92.7 %

3.3. Methods and measures

The interview methods and image coding schemes used in this study followed those of the previous study and that of Fiske et al. Hazard images were elicited by asking participants to "imagine what would happen if a major release of gas occurred at the chlorine production and storage plant" and to "name the first few things you think about when you imagine" the event happening. After no more than two prompts ("Is there anything else that you can think of?") the participant was asked to "name the first feelings that come to mind when you think of this." Availability of image was measured by the amount of time elapsing between the end of the interviewer's request to name image elements and the participant's first response. As part of the analysis, image elements and emotional reactions were unitized to insure that each identified element contained only one idea (Ericsson & Simon, 1984). Concrete image elements were scored if the unit referred to things immediately avaiable to the senses and specific (e.g., "green cloud", "people becoming sick", "birds dying"). Abstract image elements were scored if the unit referred to generalized occurrences (e.g., "much suffering", "environmental damage", "confusion"). Active emotional responses were scored if the person felt motivated to take some action about the hazard (e.g., aggressive, hostile), whereas passive emotional responses were scored if the feeling was one of inaction (e.g., helpless, apathetic, don't care). Responses to a question about "How much have you thought about the chlorine facility in the last month?" was rated on a scale from 1, "not at all," to 10, "a major pre-occupation," and was used as a measure of issue saliency. Respondents were also asked to rate on 10-point scales the amount of concern they had about the hazard, how much they trusted that the facility was being safely managed and controlled by management and workers, the likelihood that a gas release will occur in the future, and the likelihood that injuries will occur as a result of a release.

4. RESULTS OF THE POST-RELEASE STUDY

Results are organized into five sections: 1) Availability of images; 2) Issue salience and image characteristics; 3) Relation-

ship of experiences to issue saliency and image characteristics; 4) Relationship of image characteristics to hazard judgments; 5) Changes in hazard image characteristics following the gas release. With the exception of section "5," which reports on the re-interview sub-group, the reported results are for the total post-release sample.

4.1. Availability of images

The amount of time taken to begin the hazard image report varied from almost immediately after the prompt question was asked to 25 seconds later. The mean time was 3.3 seconds. This same measure of image availability failed to show a relationship to hazard-related judgments or actions in either the Fiske et al. or the Cvetkovich and Earle surveys. One reason for this may be that some people are reporting as soon as the first image element occurs to them while others are waiting until a more complete image is formed. When asked which was true for them, seventy-one percent of the respondents said that they had reported immediately and twenty five percent said that they had waited for a complete image. These differences in reporting style were significantly correlated to availability measures ($r=.20$, $p=.0001$). This indicates that future research should make efforts to ensure that consistancy in reporting is occurring. Because of this difference, this measure is not given further consideration in the remaining results. No significant correlations were found between length of elapsed time before image report and the image characteristics. Nor were any significant correlations found between time of report and image characteristics, except that people who waited for a complete image to form tended to give more passive emotions ($r = -.11$; $p = .05$).

4.2. Issue saliency and image characteristics

Saliency of the chlorine facility was measured by the ratings of how much the facility had been thought about during the last month on a scale from 1, "not at all" to 10, "a major preoccupation." Two individuals indicated that they had not thought about the plant and 24 indicated that it had been a major preoccupation. The mean rating of saliency was 4.28 (S.D.=2.51).

Table 3 shows the frequency of reported concrete and abstract elements and active and passive emotional reactions to images. The reported images can be characterized as

Table 3. Frequency of concrete and abstract elements and active and passive emotions.

Number of responses	Percent of total sample (n = 305)			
	Abstract elements	Concrete elements	Active emotions	Passive emotions
none	15.8	57.2	68.7	6.9
one	36.4	25.9	29.1	56.7
two	28.6	13.8	2.2	26.2
three	14.5	3.0	0.0	8.0
four	3.7	0.0	0.0	1.8
five	1.0	0.0	0.0	0.0

predominantly consisting of abstract elements evoking passive emotions. A mean of 4.59 abstract elements, 0.62 concrete elements, 0.34 active emotions and 1.48 passive emotions were given per individual.

In addition to the above categories hazard images were coded according to their specific content. The coding categories were whether the images included: 1) actions such as evacuation, escape and seeking shelter, 2) consequences such as panic, illness or effects on safety, 3) the seeking of information such as listening to the radio, 4) characteristics of a gas release such as descriptions of a release cloud or explosions, 5) illicited memories of past human tragedies such as the gas release at Bhopal, India or the Vietnam War and 6) seeking shelter by remaining in a building and sealing it to prevent gas from entering. A frequency count of these themes is presented in Table 4. Total number of image elements is clearly dominated by the theme of consequences, followed in frequency by the theme of actions initiated in response to the gas release. The themes of information seeking, physical characteristics of the release, induced memories of other hazards and staying sheltered are relatively infrequent.

Table 4. Frequency of reported image themes (n = 305).

Number of responses	Theme					
	Action	Info seek	Conse-quence	Character of release	Memory	Stay/ seal
One	74	12	109	23	9	15
Two	15	3	71	4	2	29
Three	3	0	47	1	0	13
Four	0	0	11	0	0	14
Five	0	0	5	0	0	0
Six	0	0	1	0	0	0
Total	92	15	254	28	11	71

An important aspect of a hazard image is whether it contains elements related to self-protective behavior. As can be seen from Table 4 about 30% of the reported image elements included the theme of evacuation. Even fewer, about 23%, included the theme of staying in a building and sealing it against the gas. These relatively low frequencies plus that only about 5% of the image elements included the seeking of additional information indicates that spontaneous images for this hazard do not frequently include optimal strategies for self-protective behavior.

4.3. Relationship of experiences to issue saliency and image characteristics

Pearson product moment correlations between reported personal experiences related to the gas release and reported image saliency and characteristics are given in Table 5. Saliency of the gas release hazard was significantly related to all of the measured reports of personal experience. The hazardous facility was thought about frequently by people who had seen the cloud, who had been evacuated and who had suffered physical effects from the gas. It was also thought about frequently by those who had been frequently exposed to messages from the media and acquaintances that expressed high concern.

Relatively few of the image characteristics were related to personal experiences. People exposed to higher levels of expressed concern in the messages of both media and friends reported a higher number of abstract image elements. Concern expressed in friends' messages was also correlated with a higher frequency of expressed active emotions as was the experience of physical effects of the gas release.

Table 5. Correlations between personal experiences, image saliency and image characteristics (n=305).

	Image characteristic				
Experience	Saliency	Abstract	Concrete	Active	Passive
DIRECT					
See cloud (1=Y; 2=N)	-.14*	-.02	.05	-.04	.02
Evacuated (1=Y; 2=N)	-.14*	.06	-.03	-.09	.05
Experience phy. effects (1=Y; 2=N)	-.15*	-.02	-.08	-.12*	-.01
INDIRECT					
Frequency of media exposure	.13*	.00	.00	.04	.00
Impact of media (1=not conc.;9=v.conc)	.13*	.16*	-.05	.01	.06
Freq. talk to friends	.37**	.06	-.04	.04	.02
Impact talk to friends	.39**	.17*	.00	.17*	-.08

* p .01
** p .0001

Saliency was significantly related to two image characteristics. Both number of abstract elements and number of active emotions were positively correlated to number of reported times in the last month that the hazardous facility was thought about (r's = .13 and .14 respectively, p=.01). Number of concrete elements and number of passive emotions were not related to saliency (r's = -.04 and -.03, respectively).

The pattern of results presented in this section suggests that the effect of direct personal experiences on image characteristics is mediated through saliency. People have to think about a hazard relative to their direct personal experiences to give the experiences meaning and for the experiences to have an effect on generated images. Messages from others such as friends and the media seem to have a more direct effect on image characteristics. Perhaps this is so because the information received from others is "preprocessed" in the sense that it may contain already formed conclusions about the hazard.

4.4. Relationship of image characteristics to hazard judgments

Both reported number of abstract elements and reported passive emotions were correlated to judgments about possible future chlorine gas releases (Table 6). A higher number of abstract

elements and a higher number of active emotions were both associated with high estimations of the likelihood that: (1) a chlorine release will occur in the future; (2) injuries will occur because of the release; and (3) the respondent will be personally injured by the release. Reported number of abstract elements and reported number of active emotions were also associated with high levels of concern about the facility, low acceptance of the facility, and low trust in management and operation of the plant. Saliency, number of concrete elements and number of active emotions were not related to hazard judgments.

Table 6. Correlations between saliency, image characteristics and hazard judgments.

	Judgments					
Image character.	Est.of release	Est.of some injury	Est.of self injure	Accept	Concern	Trust
Saliency	-.03	-.03	.02	.01	.02	.03
Abstract	.10*	.08	.12*	-.11*	.10*	-.17**
Concrete	-.03	-.07	.03	.02	.02	.06
Active	.16**	.13*	.26**	-.21**	.17**	-.21**
Passive	-.08	-.02	-.02	.04	-.06	-.01

* p .05
** p .01

4.5. Changes in hazard image characteristics following the gas release

The accidental gas release and subsequent direct or indirect experience with it clearly increased the public's awareness of the chlorine production and storage facility. Seventy-seven percent of the total post-release sample spontaneously mentioned the plant as one of the major technological hazards in the county, versus 52% in the pre-release sample. Was this increased public awareness accompanied by a change in images and judgments about the facility?

In light of the increased power of longitudinal over cross-sectional designs in evaluating changes (Baltes & Nesselroade, 1979), only the results from respondants who completed both pre- and post-release surveys are used to evaluate the effect of the accidental gas release on image characteristics and hazard judgments. Pre- and post-release saliency and image characteristic measures are presented in Table 7. Clearly the gas release produced an increase in the saliency of the hazardous facility. Significant changes were also found for all four of the image characteristics. Both the frequency of reported abstract elements and passive emotions increased across the two measurement points, whereas there was a significant decrease in the reported number of concrete elements and active emotions. Characteristics

of the hazard images changed following the gas release, but the images did not become more vivid.

Table 7. Means, standard deviations and analysis of variance results for pre- and post-release measures of saliency and image characteristics.

Measure	Pre-release Mean	S.D.	Post-release Mean	S.D.	F	p
Saliency	1.88	2.11	4.37	2.50	40.64	.0001
Abstract elements	0.97	0.95	1.42	1.17	7.88	.007
Concrete elements	1.21	1.27	0.58	0.80	12.09	.001
Active emotions	0.93	0.93	0.31	0.50	30.72	.0001
Passive emotions	0.33	0.59	1.16	0.88	40.02	.0001

Significant changes were also found for four of the six measured hazard judgments (see Table 8). There were increases in the estimated chances of a future release, that someone would be injured by the release and that the person making the judgment would be injured. There was also an increase in expressed concern about the facility. However, no change was found in the acceptance of the existance of the facility at its present location nor was there a change in the trust about the facilities mangement and operation.

Table 8. Means, standard deviations and analysis of variance results for pre- and post-release measures hazard judgments.

Judgment	Pre-release Mean	S.D.	Post-release Mean	S.D.	F	p
Est. of release	0.39	1.42	5.28	3.37	107.33	.0001
Est. of some injury	1.31	1.44	2.62	2.49	11.07	.002
Est. of self injury	3.83	2.62	4.83	2.95	5.21	.03
Concern	4.55	3.04	6.84	2.89	24.64	.0001
Trust	4.97	2.95	5.24	3.05	0.42	ns
Acceptance	4.67	3.17	4.34	3.05	0.33	ns

5. DISCUSSION AND CONCLUSION

The pattern of results of this study are summarized in Figure 1. The results support the expectations that hazard image characteristics do predict hazard judgments and that (at least some aspects of) image vividness is influenced by direct and indirect accident experiences. The study supports the validity of the hazard image concept and suggest its useful in understanding hazard adaptation behaviors. These suggested relationships, of

course, are based on simple descriptive and correlational analyses. More sophisticated multivariant analysis further exploring these relationships are planned for the near future.

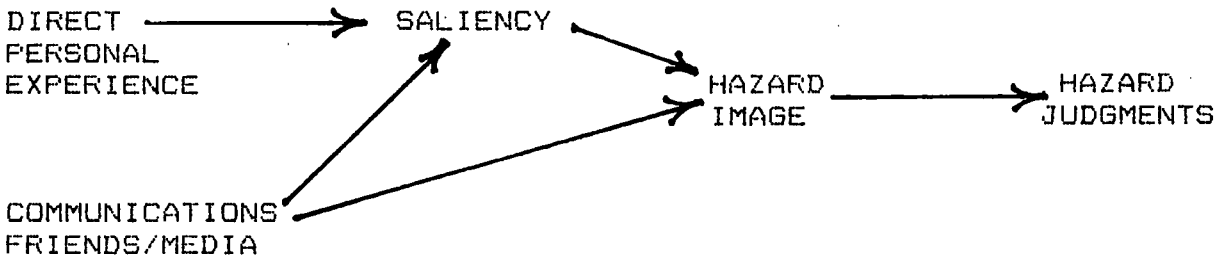

Figure 1. Model of effects of experience on image characteristics and judgments.

The results also suggest that hazard image characteristics are not changed directly by the concrete sensory qualities of an accident. The signal value of an accident, as reflected in the concreteness of a hazard image and the active emotional response it induces, is greatly colored by interpretations of the accident's context. Thus, existing mental models concerning the processes underlying a hazard and management of the hazard influence the meaning of an accident. If citizens' mental models indicate that there exists a community repertoire for understanding and effectively responding to a hazard, as seems to be the case for the hazard studied here, an accident will not be interpreted as an emergency signal. The chlorine gas release can be described as producing a state of vigilance. As reflected in hazard judgments, citizens became more concerned and increased estimates of statistical risk. The accident did not produce an increase in image vividness, nor did concerted efforts to change the riskiness of the hazard occur. One implication of the study is that it indicates some limits concerning efforts to get citizens concerned and "involved" with environmental and health hazards through the use of depicted images. These efforts will not be successful if they fail to consider existing thinking about the hazard.

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