Natural Hazard Research

THE MEANING OF A HAZARD-APPLICATION OF THE SEMANTIC DIFFERENTIAL

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1969

Working Paper #7

PREFACE

This paper is one in a series on research in progress in the field of human adjustments to natural hazards. It is intended that these papers will be used as working documents by the group of scholars directly involved in hazard research as well as inform a larger circle of interested persons. The series is now being supported from funds granted by the U. S. National Science Foundation to the University of Chicago and Clark University. Authorship of papers is not necessarily confined to those working at these institutions.

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THE MEANING OF A HAZARD-APPLICATION OF THE SEMANTIC DIFFERENTIAL*

Introduction

In order to understand and predict human behavior in hazard and disaster situations more attention must be given to the examination of those preconceived ideas and feelings held by the individual about the potential hazard. The human organism is continually distinguishing between, and estimating the degree to which, situations in which he is involved are beneficial, or at least harmless, and those that are threatening to his welfare. This evaluation is a function not only of the stimuli received from the situation but of the manner in which these stimuli are processed or interpreted. As Lazarus describes it:

> The mechanism by which the interplay between the properties of the individual and those of the situation can be understood is the cognitive process of appraisal, a judgment about the meaning or future significance of situation based not only on the stimulus, but on the psychological makeup.
>
> . . . .
>
> The appraisal of threat is not a single perception of the elements of the situation, but a judgment, an inference in which the data are assimilated to a constellation of ideas and expectations.[1]

By "meaning of hazard", then, we wish merely to refer to the significance of the hazard to the human organism before he is bombarded

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* The authors wish to acknowledge the helpful comments of John Sims of the University of Chicago on a draft of this paper. Mary Barker, University of Toronto, assisted in the design of the S-D test.

with environmental stimuli depicting the hazard. We are not concerned at this time whether this "meaning" has been acquired as a result of actual previous experience with the hazard or merely from contact with television documentaries, books, or any other of the numerous communication media.[2] We are interested in those preconceived ideas, feelings, or expectations held by the individual with regard to a particular hazard, no matter how they were formed. We wish to focus, therefore, on one aspect of the cognitive process of appraisal, one which the literature suggests to be an important if not the most crucial factor in understanding individual response to hazard situations.[3] As one author puts it:

> . . .the meaning of a catastrophe to a group or an individual is more important than all other factors which influence the effectiveness of the responses to the crisis.

Psychological preparation in the form of training for and education about the potential disaster is the most effective means to defend against unfavourable or inappropriate human reactions.[4]

This study will introduce a psychological technique by which a measurement of "meaning" can be obtained and will apply this technique to a group of subjects who will evaluate the meaning of twelve hazard situations.

The Semantic Differential

The semantic differential is a psychological technique which makes use of linguistic encoding as an index of meaning. It uses a combination of association and scaling procedures in measuring the psychological meaning of concepts--in our study, hazards. Osgood, the principal innovator of the technique describes the basic ingredients of the method below:

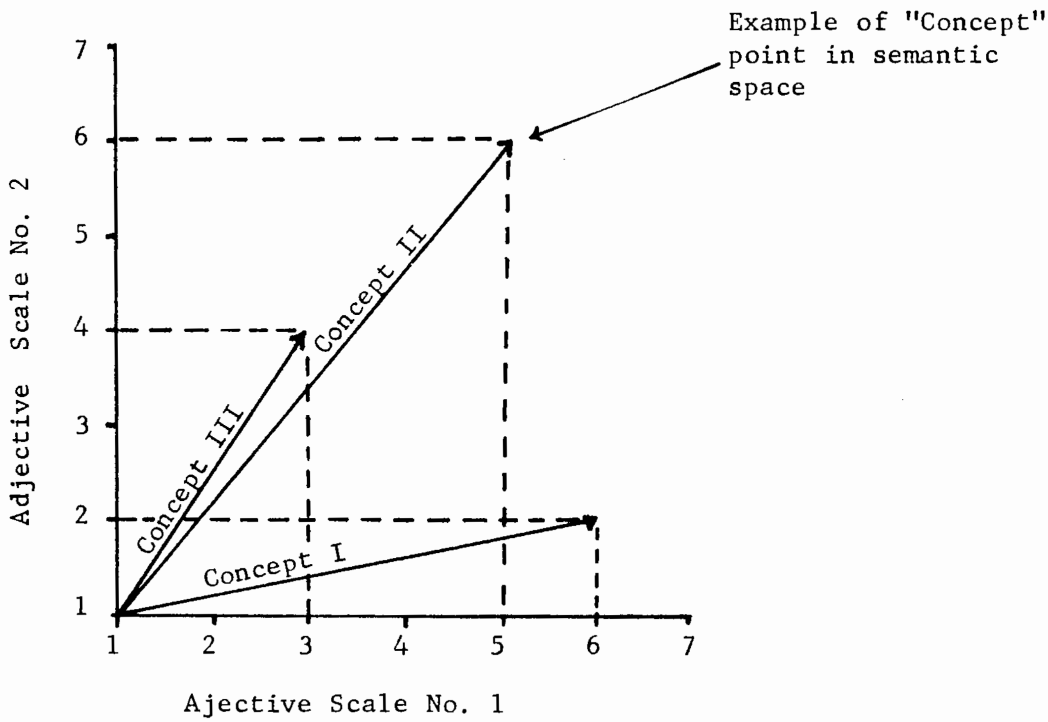
> We provide the subject with a concept to be differentiated and a set of bipolar adjectival scales against which to do it, his only task being to indicate, for each item (pairing of a concept to a scale), the direction of his association and its intensity on a seven-step scale. The crux of the method, of course, lies in selecting the sample of descriptive polar terms. Ideally, the sample should be as representative as possible of all the ways in which meaningful judgments can vary, and yet be small enough in size to be efficient in practice. In other words, from the myriad linguistic and non-linguistic behaviors mediated by symbolic processes, we select a small but carefully devised sample, a sample which we shall try to demonstrate is chiefly indicative of the ways that meanings vary, and largely insensitive to other sources of variation.[5]

The connotative meanings of concepts, therefore, can be thought of as representing points in what Osgood called "semantic space, a region of some unknown dimensionality and Euclidian in character."[6]

> Each semantic scale, defined by a pair of polar (opposite in meaning) adjectives, is assumed to represent a straight line function that passes through the origin of this space, and a sample of such scales then represents a multidimensional space. The larger or more representative the sample, the better defined is the space as a whole.[7]

Figure 1 offers a very simplified expression of the semantic space displaying how three concepts are located in 2-dimensional space as a function of the directions of association (represented by the "1" and "7" polarities) and their intensities (value of 1 to 7) of two bipolar adjectival scales that a subject has associated with each of three concepts. From this diagram it should be clear that ". . . the larger the number of scales and the more representative the selection of these scales, the more validly does this point in the space represent the operational meaning of the concept."[8] It also makes understandable Osgood's definition of semantic differentiation --"the successive allocation of a concept to a point in the multidimensional

FIGURE 1


Example of "Concept" point in semantic space
Adjective Scale No. 2
Ajective Scale No. 1
Concept I
Concept II
Concept III
1
2
3
4
5
6
7

semantic space by selection from among a set of given scaled semantic alternatives. Difference in meaning between two concepts is then merely a function of the differences in their respective allocations within the same space."[9]

Osgood in his development of the semantic differential technique went on and postulated on the basis of empirical experimentation that the semantic space could be efficiently defined by three orthogonal dimensions or axes of the space which he referred to as the Activity, Evaluative and Potency dimensions.[10]

The Elements of the Semantic Differential Test

The Concepts: The twelve concepts used for the test are listed in Table 1. They comprise a heterogeneous group of hazards of varying genesis, scale frequency, and magnitude of event and consequence.

The Scales: In Table 2 are the twenty-one bipolar adjectival scales that were employed in the analysis representing prominent scales of the evaluative, potency, and activity dimensions as defined by Osgood, Suci, Tannenbaum, and Tucker.[11] In addition, several other scales were selected which had not been represented highly on any of these three initial dimensions because they appeared to represent appropriately the character of the twelve concepts. Figure 2 below illustrated the general form of the adjective scale.

FIGURE 2

ACTIVE ____ ____ ____ ____ ____ ____ ____ PASSIVE

The respondent was asked to place an X in one of the seven space locations,

TABLE 1

LIST OF CONCEPTS

1. Earthquake
2. Tornado
3. Snowstorm
4. Flood
5. Housefire
6. Building Collapse
7. Boat Accident
8. Auto Accident
9. Air Pollution
10. Water Pollution
11. Riot
12. Epidemic

TABLE 2

BIPOLAR ADJECTIVAL SCALES

1.	Passive	Active
2.	Orderly	Chaotic
3.	Natural	Unnatural
4.	Stable	Unstable
5.	Widespread	Localized
6.	Peaceful	Ferocious
7.	Fair	Unfair
8.	Dissonant	Harmonious
9.	Slow	Fast
10.	Strong	Weak
11.	Private	Public
12.	Important	Unimportant
13.	Relaxed	Tense
14.	Erratic	Periodic
15.	Determinate	Fortuitous
16.	Yielding	Tenacious
17.	Artificial	Natural
18.	Controllable	Uncontrollable
19.	Pleasant	Unpleasant
20.	Light	Heavy
21.	Constrained	Free

thereby indicating the quality (direction) and intensity of meaning he associated with the concept.

The Subjects: The semantic differential test was given during July and August of 1968 to 58 subjects, primarily university summer extension students of various socio-economic backgrounds.[12]

Treatment of Data

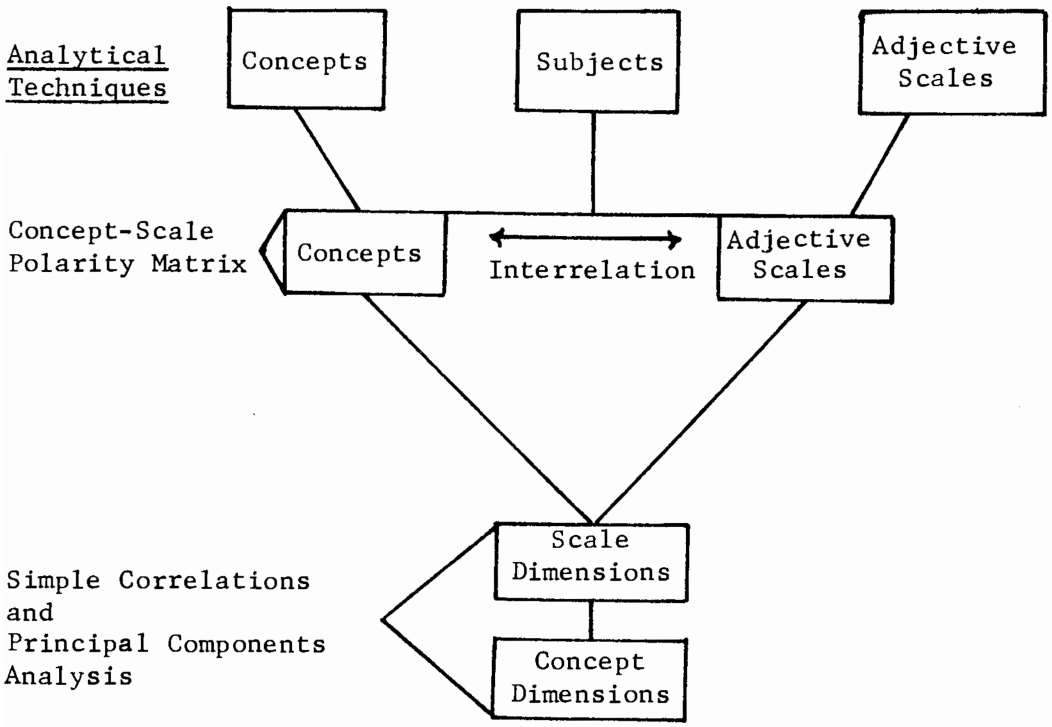
Every subject judged each concept against the 21 adjectival scales, each scale thereby being responded to 696 times. In the actual test schedule given to each respondent (see Appendix 1) both the scales and the concepts were randomly arranged so that no apparent order was discernible.[13] Figure 3 gives a schematic presentation of the data analysis. The first stage was concerned with summarizing how each concept was described in terms of the adjectival scales and in examining how the direction and intensity of response varied from one concept to another. The analysis involved the construction of a 12 x 21 matrix of adjectival scale means which were classified by intensity and direction of polarity. The second stage of the study consisted of a statistical analysis of (a) the interrelationships between the various adjectival scales and (b) the interrelationships between the twelve concepts. In both instances the overall purpose was to simplify and discern the structure of the interrelationships or more precisely to delineate patterns or dimensions of human meanings toward the concept of the hazard.

The Statistical Analysis

Two principal statistical methods were employed to analyze the data.

FIGURE 3

SCHEMATIC PRESENTATION OF DATA ANALYSIS



The interrelationships among the concepts, and the scales, were measured by the coefficient of correlation.[14] Secondly, factor analysis (principal components solution)[15] was employed to explain these interrelationships in terms of distinct patterns or dimensions. A 12 x 12 and a 21 x 21 correlation matrix was constructed respectively for the set of concepts and scales. If subscripts _i_ and _k_ refer to the scales, _j_ and _e_ to the concepts and _v_ to the subjects, the correlation matrices were found by computing:

$$\frac{\sum_{j=1}^{12} \sum_{v=1}^{58} (x_{ijv} - x_i) \cdot (x_{kjv} - x_k)}{\left(\sum_{j=1}^{12} \sum_{v=1}^{58} (x_{ijv} - x_i)^2 \cdot \sum_{j=1}^{12} \sum_{v=1}^{58} (x_{kjv} - x_k)^2 \right)^{\frac{1}{2}}} = \left[R_{ik} \right] 21\text{x}21 \quad \text{for all } i,\ k$$

and

$$\frac{\sum_{i=1}^{21} \sum_{v=1}^{58} (x_{ijv} - x_j) \cdot (x_{iev} - x_e)}{\left(\sum_{i=1}^{21} \sum_{v=1}^{58} (x_{ijv} - x_j)^2 \cdot \sum_{i=1}^{21} \sum_{v=1}^{58} (x_{iev} - x_e)^2 \right)^{\frac{1}{2}}} = \left[R_{je} \right] 12\text{x}12 \quad \text{for all } j,\ e.$$

The concept correlation matrix $\left[R_{je} \right]$ is given in Appendix 2.

The factor analysis technique has been discussed in several sources and will not be reviewed here.[16] Following the computation of the concept and scale factor matrices (derived initially from the two simple correlation matrices), three concept factors and four scale factors, respectively, were orthogonally rotated to a normal varimax position, approximating the notion of "simple structure."[17, 18]

Concept-Scale Polarity Matrix

By totalling the scores given for each scale and each concept for each subject (i.e. summing over the 58 subjects) and dividing each total by the number of subjects, a 12 x 21 matrix of means was constructed.

The means ranged from 1.1 to 6.6 and were analyzed on the basis of the five categories shown below.

GENERAL FORM		ADJECTIVAL SCALE EXAMPLE	
1.0-2.1	Polar (+) or (-)	1.0-2.1	Passive
2.2-3.3	Moderately Polar (+) or (-)	2.2-3.3	Moderately Passive
3.4-4.6	Neutral	3.4-4.6	Neutral
4.7-5.8	Moderately Polar (-) or (+)	4.7-5.8	Moderately Active
5.9-7.0	Polar (-) or (+)	5.9-7.0	Active

The resulting matrix is presented in Table 3. From it relationships can be discerned about concepts, scales, or concepts and scales. Reading along the rows reveals the various ways to which any particular adjectival scale was responded; reading down the columns the meanings given to the concepts; and, of course across and down, that is, looking at any one cell reveals the relationship between the concept and scale.

Earthquake, for example, can be described as active, chaotic, moderately natural, unstable, moderately localized, ferocious, moderately unfair, dissonant, fast, strong, public, important, tense, moderately tenacious, natural, uncontrollable, unpleasant, moderately heavy, and free. In addition the average respondent has neutral feelings as to whether an earthquake is erratic versus periodic or determinate versus fortuitous. The word picture of air pollution is distinctively different, on the other hand, and is described as moderately active, moderately unnatural, moderately unstable,

TABLE 3. CONCEPT-SCALE POLARITY MATRIX

Scales	Earthquake	Tornado	Snowstorm	Flood	Housefire	Building Collapse	Boat Accident	Auto Accident	Air Pollution	Water Pollution	Riot	Epidemic
Passive(PA)-Active (AC)	AC	AC	AC	AC	AC	AC	mAC	AC	mAC	mAC	AC	mAC
Orderly (OR)-Chaotic(CH)	CH	CH	N	CH	CH	CH	CH	CH	N	mCH	CH	mCH
Natural (NA)-Unnatural(UN)	mNA	NA	NA	mNA	mUN	mUN	mUN	mUN	mUN	mUN	mUN	N
Stable(ST)-Unstable(US)	US	US	mUS	mUS	mUS	mUS	mUS	mUS	mUS	mUS	US	mUS
Widespread (WI)-Localized(LO)	mLO	LO	N	N	LO	mLO	mLO	N	mWI	mWI	mLO	N
Peaceful(PE)-Ferocious(FE)	FE	FE	mFE	FE	FE	mFE	mFE	mFE	mFE	mFE	FE	mFE
Fair(FA)-Unfair(UF)	mUF	N	mFA	N	mUF	mUF	N	mUF	mUF	mUF	mUF	mUF
Dissonant (DI)-Harmonious(HA)	DI	mDI	N	mDI	mDI	mDI	DI	DI	mDI	mDI	DI	mDI
Slow(SL)-Fast(FS)	FS	FS	mFS	mFS	FS	FS	mFS	FS	N	N	FS	mFS
Strong(SG)-Weak(WE)	SG	SG	mSG	SG	mSG	mSG	mSG	mSG	mSG	mSG	mSG	mSG
Private(PV)-Public(PU)	PU	PU	PU	PU	N	mPU	N	mPU	PU	PU	PU	PU
Important(IM)-Unimportant(UM)	IM	IM	mIM	IM	IM	IM	IM	IM	IM	IM	IM	IM
Relaxed(RE)-Tense(TE)	TE	TE	N	TE	TE	TE	TE	TE	mTE	mTE	TE	TE
Erratic(ER)-Periodic(PR)	N	N	mPR	mER	mER	mER	N	N	N	N	mER	N
Determinate(DE)-Fortuitous(FO)	N	N	N	N	N	N	N	N	mDE	mDE	mDE	N
Yielding(YI)-Tenacious(TN)	mTN	mTN	N	mTN	mTN	N	N	mTN	mTN	mTN	mTN	mTN
Artificial(AR)-Natural(NT)	NT	NT	NT	mNT	mAR	N	mAR	mAR	AR	mAR	mAR	mNT
Controllable(CO)-Uncontrollable(UC)	UC	UC	UC	N	mCO	N	mCO	mCO	mCO	CO	N	mCO
Pleasant(PL)-Unpleasant(UP)	UP	UP	N	UP	UP	UP	UP	UP	UP	UP	UP	UP
Light(LI)-Heavy(HE)	mHE	HE	mHE	mHE	mHE	mHE	N	mHE	mHE	mHE	mHE	mHE
Constrained(CS)-Free(FR)	FR	FR	FR	FR	N	N	N	N	N	N	N	N

m - Moderately

N - Neutral

moderately widespread, moderately ferocious, moderately unfair, moderately dissonant, moderately strong, public, important, moderately tense, moderately determinate, moderately tenacious, artificial, moderately controllable, unpleasant, and moderately heavy, plus the average subject has neutral feelings as to whether air pollution is orderly versus chaotic, slow versus fast, erratic versus periodic, and constrained versus free.

These two examples provide an illustration of the average "meaning" these hazards have for the subject in terms of the selected adjectival scales. The selection of the scales, of course, as was emphasized earlier is the crucial operation. The "meaning" of a hazard is restricted by the nature of the adjectival scales selected. This is probably the most useful aspect of the semantic differential for it allows the researcher to "filter out" that "meaning" of the hazard possessed by a group of subjects that has the greatest utility in reference to the particular hazard situation or situations he is studying--that is, the "meaning" which will provide him with the greatest understanding as to how the group of subjects are likely to appraise a hazard situation that they find themselves in. The next section will examine the adjectival scales used in this study attempting to discern any similarities in their response pattern that might be useful in determining the selection procedure.

Table 4, describing the intensity of response to each of the hazards, summarizes a major portion of the information presented in the previous matrix. The frequency of polar, moderately polar, and neutral adjectival scales have been recorded and ranked. Sixteen, for example, of the 21 adjectival scales describing tornado were polar in form with only two moderately polar and two neutral responses. The concept, snowstorm, on

TABLE 4

ANALYSIS OF INTENSITY OF "MEANING"

	FREQUENCY OF ADJECTIVE RESPONSE					
	Polar		Moderately Polar		Neutral	
Concept	No.	Rank	No.	Rank	No.	Rank
Tornado	16	1	2	12	3	9
Earthquake	14	2	5	11	2	11.5
Riot	10	3	9	7.5	2	11.5
Flood	9	4	8	9.5	4	6
Housefire	8	5	10	5	3	9
Auto Accident	7	6	10	5	4	6
Building Collapse	6	7.5	10	5	5	3.5
Snowstorm	6	7.5	8	9.5	7	1.5
Boat Accident	5	9	9	7.5	7	1.5
Air Pollution	4	11	13	2	4	6
Water Pollution	4	11	14	1	3	9
Epidemic	4	11	12	3	5	3.5

the other hand was described by 6 polar adjectival scales, 8 moderately polar, and 7 neutral adjectival scales. Water pollution presents yet another pattern of response with 4 polar, 14 moderately polar, and 3 neutral adjectival scales. Table 4, used to identify intensity of meaning, along with the concept-scale matrix to supply more detailed information including direction of meaning, together give a very revealing cross-sectional view of the concept. There is obviously considerable similarity in the average meaning given by the subject to several of these concepts. These similarities will by analyzed statistically when the concept "dimensions" are considered.

The Scale Dimensions

The four varimax rotated factors explained only 45.8% of the variance of the correlation matrix but the factor structure that did emerge revealed some distinctive response patterns (see Table 5).

It is always difficult to identify "factors" and in this type of analysis there is an even greater difficulty, if not danger of error, because there is the possibility that the researcher will provide his own subjectively biased interpretation of what the responses "mean" when he is identifying his factors. Nevertheless, while some may disagree with the labels placed on these factors, it is likely they will agree that there is an internal consistency in each group of adjectival scales that have been defined.

The first factor, explaining the largest variance (18.0%), has been identified as STABILITY because it contains a predominance of adjectival scales depicting various states of equilibrium or deviations from some

TABLE 5

FACTOR ANALYSIS OF SCALES

Scale	Loading	Osgood *et al.* Dimensions
FACTOR I STABILITY		
Passive--Active	-0.516	Activity
Orderly--Chaotic	+0.627	Evaluative
Stable--Unstable	+0.471	Unassigned
Peaceful--Ferocious	-0.757	Unassigned
Dissonant--Harmonious	+0.543	Evaluative
Slow--Fast	-0.629	Activity
Relaxed--Tense	-0.717	Evaluative
Pleasant--Unpleasant	+0.489	Evaluative
FACTOR II CONTROLLABILITY		
Natural--Unnatural	+0.832	Unassigned
Fair--Unfair	+0.520	Evaluative
Artificial--Natural	-0.805	Unassigned
Controllable--Uncontrollable	-0.575	Unassigned
FACTOR III MAGNITUDE		
Widespread--Localized	+0.514	Unassigned
Strong--Weak	+0.460	Potency
Private--Public	+0.685	Unassigned
Important--Unimportant	+0.434	Unassigned
Determinate--Fortuitous	-0.372	Unassigned
Yielding--Tenacious	+0.442	Potency
Light--Heavy	+0.518	Potency
FACTOR IV EXPECTANCY		
Erratic--Periodic	+0.436	Unassigned
Free-Constrained	+0.667	Unassigned

SUMMARY OF FACTOR STRUCTURE

Factor Number	Identification	Eigenvalue	% Variance Explained	No. of Loading Scales
1	Stability	3.79	18.0	8
2	Controllability	2.61	12.4	4
3	Magnitude	1.88	8.9	7
4	Expectancy	1.35	6.5	2
	TOTALS	9.63	45.8	21

"normal" condition. We interpret these scales as representing that part of the "meaning" of the hazard related to its potential impact or effect, describing as they do levels of confusion, activity, discord and unpleasantness.

Factor II has been identified as CONTROLLABILITY including adjectival scales that appear to describe the natural, uncontrollable--unnatural, controllable dichotomy of hazard genesis.

Factor III has been labelled MAGNITUDE because virtually all its adjectival scales with the exception of "determinate--fortuitous" (which was, however, a rather low factor loading) suggest the meanings of magnitude, strength, or seriousness. In an aspatial sense, for example, are the scales light--heavy, important--unimportant, strong--weak, and yielding--tenacious. The adjectival pairs of widespread--localized and private--public on the other hand suggest magnitude or extent in spatial sense.

Factor IV has been termed EXPECTANCY because it appears to suggest a "meaning" depicting the likelihood of a potential hazard occurring or more correctly, its regularity of occurrence. Perhaps we are reading in too much here--perhaps other adjectival scales would be more appropriate to suggest this aspect of hazard meaning.[19]

Each of these above dimensions, it is suggested, describes one aspect of what is meant by "meaning" of a hazard to a subject. There are undoubtedly others and their formation and application should depend on the kind of information required about the subjects' preconceived ideas and evaluations of the potential hazard.

<u>The Concept Dimensions</u>

Care must be taken in interpreting similarities between concepts as revealed by Table 4. The imposing of numerical boundaries defining the "polarity" of adjectival scales can create severe interpretation problems. The most important, perhaps, is that no distinction is made as to where in the frequency interval the response lies. While scores, for example, of 2.1 and 2.2 are placed in different categories, 2.2 and 3.3 are placed in the same category.[20] Statistical analysis provided by simple correlation coefficients and factor analysis therefore provides a more rigorous approach for determining concept similarity.

The three rotated factors explained 76.7% of the variance of the correlation matrix. Table 6 summarizes the factor structure of the concepts with Figure 4 displaying the factor loading values of the twelve hazards on the initial two factors.

The first and largest "explaining" factor (34.3% of the variance) termed MAN-MADE HAZARDS includes those hazards with the highest frequency of occurrence, and which directly or indirectly originate from some form of human action and that specifically involve physical objects or structures. As a group they assume a somewhat median position in terms of the intensity of feelings and response they evoke.

Factor II labelled NATURAL HAZARDS explaining 24.4% of the variance included on the other hand those hazards originating directly from man's environment, the genesis of which he influences little if at all. These hazards are far less frequent in occurrence and of much greater scale and magnitude. With the exception of the snowstorm concept, these hazards generated more extreme and intensive feelings and ranked high in the number

TABLE 6

FACTOR ANALYSIS OF CONCEPTS

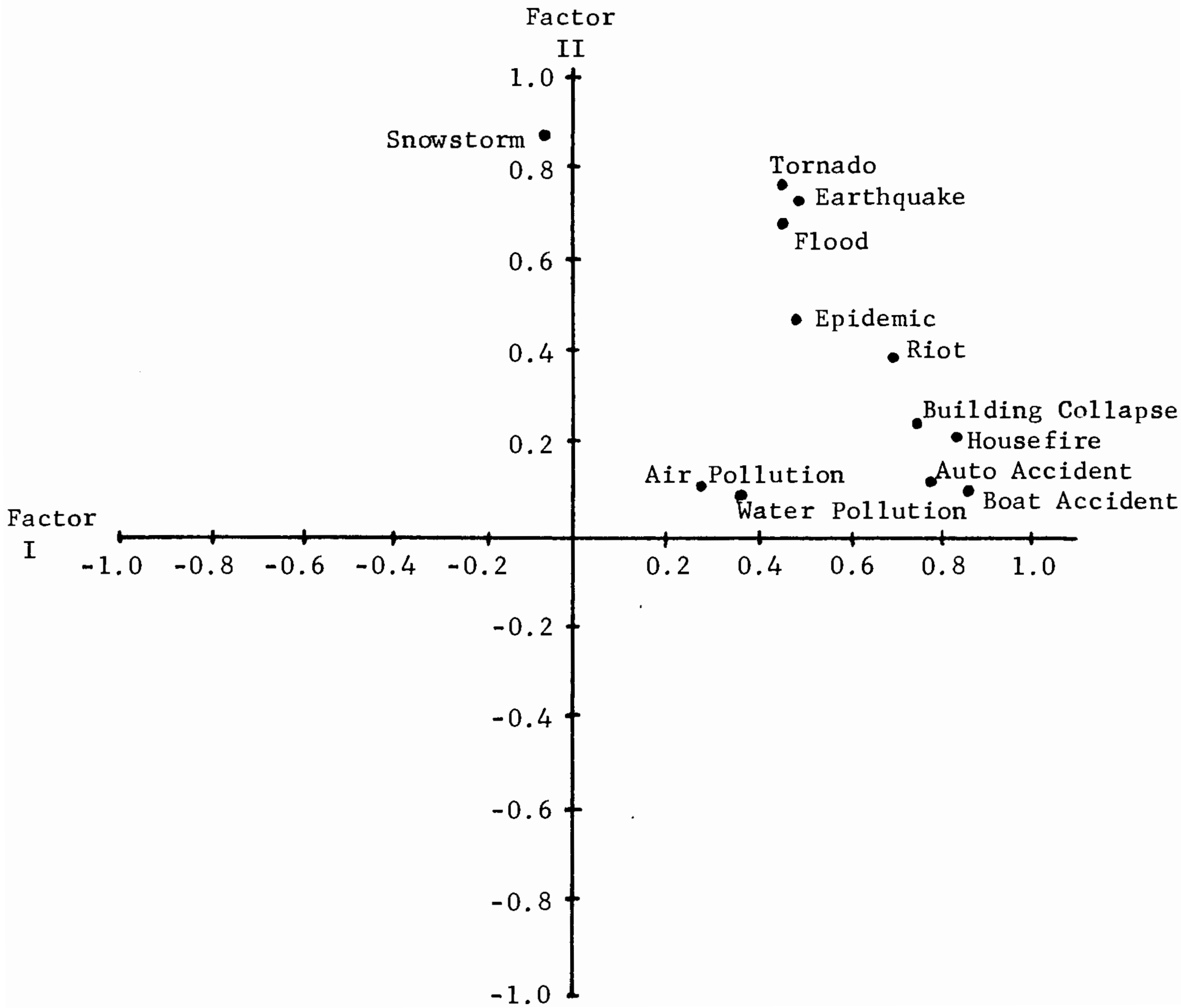
Concept	Factor Loading
FACTOR I MAN-MADE HAZARDS	
Housefire	+0.820
Building Collapse	+0.757
Boat Accident	+0.847
Auto Accident	+0.794
Riot	+0.676
Epidemic	+0.482
FACTOR II NATURAL HAZARDS	
Earthquake	+0.754
Tornado	+0.767
Snowstorm	+0.862
Flood	+0.691
FACTOR III QUASI-NATURAL HAZARDS	
Air Pollution	+0.895
Water Pollution	+0.862

SUMMARY OF FACTOR STRUCTURE

Factor Number	Identification	Eigenvalue	% Variance Explained	No. of Loading Concepts
1	Man-Made Hazards	4.11	34.3	6
2	Natural Hazards	2.93	24.4	4
3	Quasi-Natural Hazards	2.16	18.0	2
	TOTALS	9.20	76.7	12

FIGURE 4

LOADING VALUES OF CONCEPTS ON TWO PRINCIPAL FACTORS



of polar adjective responses received.[21]

Factor III explaining 18% of the variance includes the hazards of air and water pollution. This factor has been labelled QUASI-NATURAL HAZARDS including hazards that have originated via an intimate and disrupting association between man and his natural environment. These hazards generated few polar or neutral adjective responses, but a large number of "moderate" responses.

The factor analysis has revealed three distinctive groups of hazards defined by our subject sample in reference to a particular set of adjectival semantic scales. The semantic differential thus provides a very sensitive type of classification procedure, one which is based on the significance of the hazard to a subject and which is focused on a "meaning" of the hazard which is most useful and interpretive to a researcher attempting to understand and predict individual appraisal of and response to the potential hazard.

Conclusions

We have emphasized the importance of the preconceived idea or expectation held by a subject (his "meaning") with regard to a potential hazard as being a crucial factor in understanding or predicting his response. We have adopted a psychological technique by which "meaning" can be defined and applied it to a group of 58 subjects. The results of the experiment suggested that the technique represents a very useful and efficient approach by which the "meaning" of a hazard can be derived. In addition it was shown to be a very sensitive instrument that could be utilized for the classification of hazards. Subsequent research directions suggested by this study include: (a) additional experimentation with the semantic differential using various hazard types and other adjectival semantic scales; (b) further examination of (a) using different subgroups of subjects identified either by socio-economic or psychological traits; and, (c) attainment of standardization in construction and application of technique.

NOTES

1. Richard S. Lazarus, Psychological Stress and the Coping Process (Toronto: McGraw-Hill Book Co., 1966), p. 44.

2. See, for example, B. Tufty, 1001 Questions Answered About Natural Land Disasters (New York: Dodd, Mead and Co., 1969).

3. See, for example, I. Burton, R. W. Kates, and R. E. Snead, The Human Ecology of Coastal Flood Hazard in Megalopolis, Department of Geography Research Paper No. 115 (Chicago: Department of Geography, University of Chicago, 1969); Calvin S. Draper, "Psychological Factors and Problems, Emergency and Long-Term," The Annals, American Academy of Political and Social Science, 309 (January, 1957), pp. 151-159; B. B. Hudson, "Anxiety in Response to the Unfamiliar," Journal of Social Issues, X (1954), pp. 53-60; Lawrence A. Pervin, "The Need to Predict and Control Under Conditions of Threat," Journal of Personality, 31 (1963), pp. 570-587; Harry B. Williams, "Some Functions of Communication in Crisis Behavior," Human Organization (Special Issue: Human Adaptation to Disaster), 16, 2 (Summer, 1957), pp. 15-19; and Lazarus, op. cit., pp. 85-257.

4. Draper, op. cit., p. 151.

5. This discussion of the semantic differential technique is based directly on the work of C.E. Osgood, G. J. Suci, and P. H. Tannenbaum, The Measurement of Meaning (Chicago: University of Chicago Press, 1957). See page 20 for quote. See also C. E. Osgood, " A Behavioristic Analysis of Perception and Language As Cognitive Phenomena," in Modern Systems Research for the Behavioral Scientist, edited by W. Buckley (Chicago: Aldine Publishing Co., 1968), pp. 186-203. For a general discussion of the semantic differential as a technique including more recent applications see F. N. Kerlinger, Foundations of Behavioral Research (Toronto: Holt, Rinehart and Winston, Inc., 1964), Chapter 32.

6. Osgood, Suci and Tannenbaum, op. cit., p. 25

7. Ibid., p. 25

8. Ibid., p. 26

9. Ibid.

10. For further discussion see ibid., pp. 31-75.

11. In the measurement of attitude Osgood, Suci, and Tannenbaum suggest using principally "evaluative" scales. However, it is argued that what constitutes an evaluative scale is not constant but varies with the nature of the concepts selected and that in addition "attitude" is a multidimensional notion. See pp. 189-216.

12. The subjects in this study were treated as a homogeneous group--that is, there was no attempt to evaluate how any particular subgroup of subjects based either on socio-economic or psychological traits differed in terms of the meaning they assigned to any concept. This type of analysis obviously represents a potential research direction.

13. The positions of the pole extremities also were varied throughout all the scales such that the "high" and "low" values were randomly left and right justified throughout the test.

14. The use of the correlation coefficient as a measurement of association between concepts is not recommended by Osgood because of the distorted picture that may be created by large variance among the concept means. Since the means of the concepts in this study varied only from 4.02 to 4.40, this problem is not apparent and the correlation coefficient is judged to be a reliable similarity measure. See Osgood, Suci, and Tannenbaum, op. cit., pp. 87-97.

15. A description of the computer program used for the principal components solution can be found in W. J. Dixon, ed., BMD Biomedical Computer Programs, 2nd edition (Berkeley: University of California Press, 1967), pp. 169-184.

    All computer programming of the statistical analyses was performed on the 360-65 computer system at the University of Toronto.

16. For a general source see H. H. Harman, Modern Factor Analysis (Chicago: University of Chicago Press, 1960). For a good methodological discussion see the two papers by R. B. Cattell, both titled "Factor Analysis: An Introduction to Essentials," the first subtitled, "I: The Purpose and Underlying Models," Biometrics (March, 1965), pp. 190-215 and the second, "II: The Role of Factor Analysis in Research," Biometrics (June, 1965), pp. 405-435. For a geometric interpretation see especially B. Fruchter, Introduction to Factor Analysis (Princeton, N. J.: D. Van Nostrand Co., Inc., 1954). For a recent use of factor analysis by a geographer see R. A. Murdie, Factorial Ecology of Metropolitan Toronto, 1951-1961, Department of Geography Research Paper No. 116 (Chicago: Department of Geography, University of Chicago, 1969). Lists of further references are given in all these sources.

17. Factors generally are rotated analytically so that each variable will have as high a loading as possible on one factor and zero or near zero loadings on other factors. See L. L. Thurstone, Multiple Factor Analysis (Chicago: University of Chicago Press, 1947).

18. Following the work of Henry F. Kaiser (see Harman, op. cit., pp. 362-283) a factor with an eigenvalue of one is usually considered statistically significant. Preliminary analyses investigated the rotated factor solutions of two and three factors respectively of the concept factor matrix and three, four, and five factors respectively of the scale factor matrix. On the basis of their substantive contributions

to the interpretation of the data, a three rotated factor solution was retained in the concept factor matrix even though the third unrotated factor had an initial eigenvalue of 0.92. Only four factors were rotated in the scale matrix despite the fact that the fifth and sixth unrotated factors had initial eigenvalues of over 1.00. These latter two factors were difficult to define substantively and in addition their variance contributions were each less than 5%.

Helpful criticism and suggestions regarding the statistical analysis were provided by Ian Spence, Department of Psychology, and Geoffrey McDonald, Department of Geography, both Ph.D. candidates at the University of Toronto.

19. It is not surprising that the dimensions of this analysis should not concur with the generally persistent evaluative, potency and activity dimensions of Osgood and others. There are two principal explanations --(1) the concepts of this study are not mutually exclusive or independent of each other, and (2) as D. Kretch and R. S. Crutchfield suggest, scale dimensions are not constant over all types of concepts and subjects. See their work Theory and Problems in Social Psychology (New York: McGraw Hill, 1948), pp. 195-196 (cited in Osgood, p. 197).

20. It should be noted, however, that in initially choosing these class intervals, the authors attempted to minimize this problem.

21. If the concept correlation matrix (Appendix 2) is examined it will be observed that the coefficient between snowstorm and the other loading concepts of factor 2 is lower than the coefficients between the three concepts of earthquake, tornado and flood.

Respondent Number ________

Summer 1968
NHT 6805

INSTRUCTIONS

The purpose of this study is to measure the meanings of certain things to various people using a series of descriptive scales. In taking this test, please make your judgements on the basis of what these things mean to you. On each page you will find a number of different concepts to be judged and beneath them a set of scales. You are asked to rate the concept on each of these scales in order.

If you feel that the concept is very closely related to one end of the scale, you should place your check-mark as follows:

Hot ____ ____ ____ ____ ____ ____ _X_ Cold

OR

Hot _X_ ____ ____ ____ ____ ____ ____ Cold

If you feel that the concept is quite closely related to one or the other end of the scale (but not extremely), you should place your check-mark as follows:

Wet ____ ____ ____ ____ ____ _X_ ____ Dry

If the concept seems only slightly related to one or the other end of the scale (but not really neutral), you should check as follows:

Ugly ____ ____ _X_ ____ ____ ____ ____ Beautiful

The direction toward which you check, of course, depends upon which of the two ends of the scale seem more characteristic of the thing you are judging. If you consider the concept neutral on the scale (both sides of the scale equally associated with the concept), or if the scale is completely irrelevant then you should place your check-mark in the middle space:

Safe ____ ____ ____ _X_ ____ ____ ____ Dangerous

IMPORTANT: (1) Be sure that you check every scale for every concept - please do not omit an

(2) Never put more than one check-mark on a single scale.

Sometimes you may feel as though you've had the same item before on the test. This will not be the case, so please do not look back and forth through the items. Do not try to remember how you checked similar items earlier in the test. Make each item a separate and independen judgement. Work at fairly high speed through the test. Do not worry or puzzle over individual items. It is your first impressions, the immediate 'feelings' about the items, tha we want. On the other hand, please do not be careless, because we want your true impressions

EARTHQUAKE

Passive _____ _____ _____ _____ _____ _____ _____ Active

Orderly _____ _____ _____ _____ _____ _____ _____ Chaotic

Natural _____ _____ _____ _____ _____ _____ _____ Unnatural

Unstable _____ _____ _____ _____ _____ _____ _____ Stable

Widespread _____ _____ _____ _____ _____ _____ _____ Localised

HOUSE FIRE

Peaceful _____ _____ _____ _____ _____ _____ _____ Ferocious

Unfair _____ _____ _____ _____ _____ _____ _____ Fair

Dissonant _____ _____ _____ _____ _____ _____ _____ Harmonious

Slow _____ _____ _____ _____ _____ _____ _____ Fast

Strong _____ _____ _____ _____ _____ _____ _____ Weak

BUILDING COLLAPSE

Private _____ _____ _____ _____ _____ _____ _____ Public

Important _____ _____ _____ _____ _____ _____ _____ Unimportant

Relaxed _____ _____ _____ _____ _____ _____ _____ Tense

Stable _____ _____ _____ _____ _____ _____ _____ Unstable

Erratic _____ _____ _____ _____ _____ _____ _____ Periodic

AIR POLLUTION

Chaotic _____ _____ _____ _____ _____ _____ _____ Orderly

Harmonious _____ _____ _____ _____ _____ _____ _____ Dissonant

Yielding _____ _____ _____ _____ _____ _____ _____ Tenacious

Artificial _____ _____ _____ _____ _____ _____ _____ Natural

Periodic _____ _____ _____ _____ _____ _____ _____ Erratic

TORNADO

Uncontrollable	___	___	___	___	___	___	___	Controllable
Weak	___	___	___	___	___	___	___	Strong
Stable	___	___	___	___	___	___	___	Unstable
Relaxed	___	___	___	___	___	___	___	Tense
Ferocious	___	___	___	___	___	___	___	Peaceful

RIOT

Pleasant	___	___	___	___	___	___	___	Unpleasant
Private	___	___	___	___	___	___	___	Public
Light	___	___	___	___	___	___	___	Heavy
Widespread	___	___	___	___	___	___	___	Localised
Peaceful	___	___	___	___	___	___	___	Ferocious

SNOWSTORM

Unstable	___	___	___	___	___	___	___	Stable
Uncontrollable	___	___	___	___	___	___	___	Controllable
Fair	___	___	___	___	___	___	___	Unfair
Erratic	___	___	___	___	___	___	___	Periodic
Important	___	___	___	___	___	___	___	Unimportant

EPIDEMIC

Controllable	___	___	___	___	___	___	___	Uncontrollable
Unnatural	___	___	___	___	___	___	___	Natural
Strong	___	___	___	___	___	___	___	Weak
Localised	___	___	___	___	___	___	___	Widespread
Orderly	___	___	___	___	___	___	___	Chaotic

BOAT ACCIDENT

Unpleasant	____	____	____	____	____	____	____ Pleasant
Dissonant	____	____	____	____	____	____	____ Harmonious
Peaceful	____	____	____	____	____	____	____ Ferocious
Constrained	____	____	____	____	____	____	____ Free
Tense	____	____	____	____	____	____	____ Relaxed

WATER POLLUTION

Passive	____	____	____	____	____	____	____ Active
Harmonious	____	____	____	____	____	____	____ Dissonant
Unnatural	____	____	____	____	____	____	____ Natural
Unfair	____	____	____	____	____	____	____ Fair
Heavy	____	____	____	____	____	____	____ Light

FLOOD

Private	____	____	____	____	____	____	____ Public
Strong	____	____	____	____	____	____	____ Weak
Peaceful	____	____	____	____	____	____	____ Ferocious
Erratic	____	____	____	____	____	____	____ Periodic
Passive	____	____	____	____	____	____	____ Active

AUTO ACCIDENT

Localised	____	____	____	____	____	____	____ Widespread
Controllable	____	____	____	____	____	____	____ Uncontrollable
Public	____	____	____	____	____	____	____ Private
Unnatural	____	____	____	____	____	____	____ Natural
Light	____	____	____	____	____	____	____ Heavy

TORNADO

Fair	___	___	___	___	___	___	___ Unfair
Slow	___	___	___	___	___	___	___ Fast
Natural	___	___	___	___	___	___	___ Unnatural
Dissonant	___	___	___	___	___	___	___ Harmonious
Periodic	___	___	___	___	___	___	___ Erratic

AIR POLLUTION

Constrained	___	___	___	___	___	___	___ Free
Fast	___	___	___	___	___	___	___ Slow
Weak	___	___	___	___	___	___	___ Strong
Peaceful	___	___	___	___	___	___	___ Ferocious
Important	___	___	___	___	___	___	___ Unimportant

EPIDEMIC

Artificial	___	___	___	___	___	___	___ Natural
Fast	___	___	___	___	___	___	___ Slow
Erratic	___	___	___	___	___	___	___ Periodic
Yielding	___	___	___	___	___	___	___ Tenacious
Stable	___	___	___	___	___	___	___ Unstable

RIOT

Active	___	___	___	___	___	___	___ Passive
Chaotic	___	___	___	___	___	___	___ Orderly
Natural	___	___	___	___	___	___	___ Artificial
Periodic	___	___	___	___	___	___	___ Erratic
Dissonant	___	___	___	___	___	___	___ Harmonious

HOUSE FIRE

Localised	___	___	___	___	___	___	___	Widespread
Public	___	___	___	___	___	___	___	Private
Fortuitous	___	___	___	___	___	___	___	Determinate
Controllable	___	___	___	___	___	___	___	Uncontrollable
Unpleasant	___	___	___	___	___	___	___	Pleasant

BOAT ACCIDENT

Unnatural	___	___	___	___	___	___	___	Natural
Important	___	___	___	___	___	___	___	Unimportant
Strong	___	___	___	___	___	___	___	Weak
Fast	___	___	___	___	___	___	___	Slow
Localised	___	___	___	___	___	___	___	Widespread

BUILDING COLLAPSE

Unfair	___	___	___	___	___	___	___	Fair
Natural	___	___	___	___	___	___	___	Unnatural
Controllable	___	___	___	___	___	___	___	Uncontrollable
Unpleasant	___	___	___	___	___	___	___	Pleasant
Determinate	___	___	___	___	___	___	___	Fortuitous

EARTHQUAKE

Yielding	___	___	___	___	___	___	___	Tenacious
Unfair	___	___	___	___	___	___	___	Fair
Erratic	___	___	___	___	___	___	___	Periodic
Public	___	___	___	___	___	___	___	Private
Heavy	___	___	___	___	___	___	___	Light

SNOWSTORM

Passive	___	___	___	___	___	___	___	Active
Ferocious	___	___	___	___	___	___	___	Peaceful
Determinate	___	___	___	___	___	___	___	Fortuitous
Yielding	___	___	___	___	___	___	___	Tenacious
Light	___	___	___	___	___	___	___	Heavy

AUTO ACCIDENT

Tense	___	___	___	___	___	___	___	Relaxed
Active	___	___	___	___	___	___	___	Passive
Dissonant	___	___	___	___	___	___	___	Harmonious
Slow	___	___	___	___	___	___	___	Fast
Fortuitous	___	___	___	___	___	___	___	Determinate

FLOOD

Chaotic	___	___	___	___	___	___	___	Orderly
Natural	___	___	___	___	___	___	___	Unnatural
Yielding	___	___	___	___	___	___	___	Tenacious
Important	___	___	___	___	___	___	___	Unimportant
Slow	___	___	___	___	___	___	___	Fast

WATER POLLUTION

Determinate	___	___	___	___	___	___	___	Fortuitous
Orderly	___	___	___	___	___	___	___	Chaotic
Private	___	___	___	___	___	___	___	Public
Important	___	___	___	___	___	___	___	Unimportant
Free	___	___	___	___	___	___	___	Constrained

HOUSE FIRE

Unnatural	___	___	___	___	___	___	___	Natural
Tense	___	___	___	___	___	___	___	Relaxed
Unimportant	___	___	___	___	___	___	___	Important
Active	___	___	___	___	___	___	___	Passive
Orderly	___	___	___	___	___	___	___	Chaotic

TORNADO

Constrained	___	___	___	___	___	___	___	Free
Localised	___	___	___	___	___	___	___	Widespread
Pleasant	___	___	___	___	___	___	___	Unpleasant
Tenacious	___	___	___	___	___	___	___	Yielding
Light	___	___	___	___	___	___	___	Heavy

EPIDEMIC

Important	___	___	___	___	___	___	___	Unimportant
Public	___	___	___	___	___	___	___	Private
Unfair	___	___	___	___	___	___	___	Fair
Tense	___	___	___	___	___	___	___	Relaxed
Unpleasant	___	___	___	___	___	___	___	Pleasant

SNOWSTORM

Widespread	___	___	___	___	___	___	___	Localised
Fast	___	___	___	___	___	___	___	Slow
Free	___	___	___	___	___	___	___	Constrained
Chaotic	___	___	___	___	___	___	___	Orderly
Unnatural	___	___	___	___	___	___	___	Natural

EARTHQUAKE

Pleasant	___	___	___	___	___	___	___	Unpleasant
Strong	___	___	___	___	___	___	___	Weak
Constrained	___	___	___	___	___	___	___	Free
Slow	___	___	___	___	___	___	___	Fast
Fortuitous	___	___	___	___	___	___	___	Determinate

BOAT ACCIDENT

Public	___	___	___	___	___	___	___	Private
Periodic	___	___	___	___	___	___	___	Erratic
Unfair	___	___	___	___	___	___	___	Fair
Light	___	___	___	___	___	___	___	Heavy
Passive	___	___	___	___	___	___	___	Active

FLOOD

Stable	___	___	___	___	___	___	___	Unstable
Unpleasant	___	___	___	___	___	___	___	Pleasant
Determinate	___	___	___	___	___	___	___	Fortuitous
Fair	___	___	___	___	___	___	___	Unfair
Free	___	___	___	___	___	___	___	Constrained

RIOT

Unnatural	___	___	___	___	___	___	___	Natural
Fortuitous	___	___	___	___	___	___	___	Determinate
Tenacious	___	___	___	___	___	___	___	Yielding
Unfair	___	___	___	___	___	___	___	Fair
Constrained	___	___	___	___	___	___	___	Free

BUILDING COLLAPSE

Yielding ___ ___ ___ ___ ___ ___ ___ Tenacious

Artificial ___ ___ ___ ___ ___ ___ ___ Natural

Heavy ___ ___ ___ ___ ___ ___ ___ Light

Chaotic ___ ___ ___ ___ ___ ___ ___ Orderly

Constrained ___ ___ ___ ___ ___ ___ ___ Free

WATER POLLUTION

Uncontrollable ___ ___ ___ ___ ___ ___ ___ Controllable

Stable ___ ___ ___ ___ ___ ___ ___ Unstable

Erratic ___ ___ ___ ___ ___ ___ ___ Periodic

Weak ___ ___ ___ ___ ___ ___ ___ Strong

Tenacious ___ ___ ___ ___ ___ ___ ___ Yielding

AUTO ACCIDENT

Important ___ ___ ___ ___ ___ ___ ___ Unimportant

Unfair ___ ___ ___ ___ ___ ___ ___ Fair

Periodic ___ ___ ___ ___ ___ ___ ___ Erratic

Chaotic ___ ___ ___ ___ ___ ___ ___ Orderly

Stable ___ ___ ___ ___ ___ ___ ___ Unstable

AIR POLLUTION

Unnatural ___ ___ ___ ___ ___ ___ ___ Natural

Passive ___ ___ ___ ___ ___ ___ ___ Active

Fair ___ ___ ___ ___ ___ ___ ___ Unfair

Fortuitous ___ ___ ___ ___ ___ ___ ___ Determinate

Unstable ___ ___ ___ ___ ___ ___ ___ Stable

EPIDEMIC

Light ___ ___ ___ ___ ___ ___ ___ Heavy

Constrained ___ ___ ___ ___ ___ ___ ___ Free

Determinate ___ ___ ___ ___ ___ ___ ___ Fortuitous

Dissonant ___ ___ ___ ___ ___ ___ ___ Harmonious

Active ___ ___ ___ ___ ___ ___ ___ Passive

Ferocious ___ ___ ___ ___ ___ ___ ___ Peaceful

SNOWSTORM

Private ___ ___ ___ ___ ___ ___ ___ Public

Pleasant ___ ___ ___ ___ ___ ___ ___ Unpleasant

Relaxed ___ ___ ___ ___ ___ ___ ___ Tense

Natural ___ ___ ___ ___ ___ ___ ___ Artificial

Harmonious ___ ___ ___ ___ ___ ___ ___ Dissonant

Weak ___ ___ ___ ___ ___ ___ ___ Strong

RIOT

Fast ___ ___ ___ ___ ___ ___ ___ Slow

Tense ___ ___ ___ ___ ___ ___ ___ Relaxed

Unstable ___ ___ ___ ___ ___ ___ ___ Stable

Important ___ ___ ___ ___ ___ ___ ___ Unimportant

Uncontrollable ___ ___ ___ ___ ___ ___ ___ Controllable

Weak ___ ___ ___ ___ ___ ___ ___ Strong

BOAT ACCIDENT

Determinate ___ ___ ___ ___ ___ ___ ___ Fortuitous

Yielding ___ ___ ___ ___ ___ ___ ___ Tenacious

Chaotic ___ ___ ___ ___ ___ ___ ___ Orderly

Natural ___ ___ ___ ___ ___ ___ ___ Artificial

Controllable ___ ___ ___ ___ ___ ___ ___ Uncontrollable

Unstable ___ ___ ___ ___ ___ ___ ___ Stable

WATER POLLUTION

Peaceful ____ ____ ____ ____ ____ ____ ____ Ferocious

Fast ____ ____ ____ ____ ____ ____ ____ Slow

Artificial ____ ____ ____ ____ ____ ____ ____ Natural

Relaxed ____ ____ ____ ____ ____ ____ ____ Tense

Unpleasant ____ ____ ____ ____ ____ ____ ____ Pleasant

Widespread ____ ____ ____ ____ ____ ____ ____ Localised

FLOOD

Harmonious ____ ____ ____ ____ ____ ____ ____ Dissonant

Heavy ____ ____ ____ ____ ____ ____ ____ Light

Relaxed ____ ____ ____ ____ ____ ____ ____ Tense

Natural ____ ____ ____ ____ ____ ____ ____ Artificial

Controllable ____ ____ ____ ____ ____ ____ ____ Uncontrollable

Localised ____ ____ ____ ____ ____ ____ ____ Widespread

AUTO ACCIDENT

Pleasant ____ ____ ____ ____ ____ ____ ____ Unpleasant

Strong ____ ____ ____ ____ ____ ____ ____ Weak

Constrained ____ ____ ____ ____ ____ ____ ____ Free

Ferocious ____ ____ ____ ____ ____ ____ ____ Peaceful

Yielding ____ ____ ____ ____ ____ ____ ____ Tenacious

Artificial ____ ____ ____ ____ ____ ____ ____ Natural

EARTHQUAKE

Harmonious ____ ____ ____ ____ ____ ____ ____ Dissonant

Peaceful ____ ____ ____ ____ ____ ____ ____ Ferocious

Relaxed ____ ____ ____ ____ ____ ____ ____ Tense

Controllable ____ ____ ____ ____ ____ ____ ____ Uncontrollable

Important ____ ____ ____ ____ ____ ____ ____ Unimportant

Natural ____ ____ ____ ____ ____ ____ ____ Artificial

HOUSE FIRE

Yielding ___ ___ ___ ___ ___ ___ ___ Tenacious

Erratic ___ ___ ___ ___ ___ ___ ___ Periodic

Stable ___ ___ ___ ___ ___ ___ ___ Unstable

Light ___ ___ ___ ___ ___ ___ ___ Heavy

Free ___ ___ ___ ___ ___ ___ ___ Constrained

Artificial ___ ___ ___ ___ ___ ___ ___ Natural

TORNADO

Determinate ___ ___ ___ ___ ___ ___ ___ Fortuitous

Unimportant ___ ___ ___ ___ ___ ___ ___ Important

Public ___ ___ ___ ___ ___ ___ ___ Private

Active ___ ___ ___ ___ ___ ___ ___ Passive

Chaotic ___ ___ ___ ___ ___ ___ ___ Orderly

Natural ___ ___ ___ ___ ___ ___ ___ Artificial

BUILDING COLLAPSE

Weak ___ ___ ___ ___ ___ ___ ___ Strong

Localised ___ ___ ___ ___ ___ ___ ___ Widespread

Harmonious ___ ___ ___ ___ ___ ___ ___ Dissonant

Ferocious ___ ___ ___ ___ ___ ___ ___ Peaceful

Passive ___ ___ ___ ___ ___ ___ ___ Active

Fast ___ ___ ___ ___ ___ ___ ___ Slow

AIR POLLUTION

Unpleasant ___ ___ ___ ___ ___ ___ ___ Pleasant

Widespread ___ ___ ___ ___ ___ ___ ___ Localised

Public ___ ___ ___ ___ ___ ___ ___ Private

Uncontrollable ___ ___ ___ ___ ___ ___ ___ Controllable

Heavy ___ ___ ___ ___ ___ ___ ___ Light

Relaxed ___ ___ ___ ___ ___ ___ ___ Tense

APPENDIX 2. CONCEPT CORRELATION MATRIX

	Earthquake	Tornado	Snowstorm	Flood	Housefire	Building Collapse	Boat Accident	Auto Accident	Air Pollution	Water Pollution	Riot	Epidemic
Earthquake	1.00	0.80	0.51	0.73	0.54	0.58	0.49	0.51	0.29	0.32	0.63	0.56
Tornado	0.80	1.00	0.51	0.72	0.54	0.54	0.45	0.49	0.28	0.30	0.63	0.56
Snowstorm	0.51	0.51	1.00	0.47	0.17	0.19	0.10	0.13	0.10	0.08	0.27	0.29
Flood	0.73	0.72	0.47	1.00	0.55	0.60	0.52	0.54	0.43	0.45	0.64	0.65
Housefire	0.54	0.54	0.17	0.55	1.00	0.67	0.72	0.70	0.43	0.49	0.69	0.55
Building Collapse	0.58	0.54	0.19	0.60	0.67	1.00	0.68	0.65	0.44	0.50	0.66	0.56
Boat Accident	0.49	0.45	0.10	0.52	0.72	0.68	1.00	0.72	0.45	0.47	0.62	0.52
Auto Accident	0.51	0.49	0.13	0.54	0.70	0.65	0.72	1.00	0.49	0.53	0.67	0.54
Air Pollution	0.29	0.28	0.10	0.43	0.43	0.44	0.45	0.49	1.00	0.76	0.50	0.46
Water Pollution	0.32	0.30	0.08	0.45	0.49	0.50	0.47	0.53	0.76	1.00	0.52	0.48
Riot	0.63	0.63	0.27	0.64	0.69	0.66	0.62	0.67	0.50	0.52	1.00	0.60
Epidemic	0.56	0.56	0.29	0.65	0.55	0.56	0.52	0.54	0.46	0.48	0.60	1.00