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Nevada Nuclear Waste Storage Investigations PROJECT
YUCCA MOUNTAIN

Nevada Nuclear Waste Storage Investigations Project

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SUGGESTED DATA-GATHERING METHODS FOR THE ASSESSMENT OF ATTITUDES OF NEVADA CITIZENS TOWARD LOCATION OF A REPOSITORY AT YUCCA MOUNTAIN

FINAL REPORT

DECEMBER 1986

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December 1986

Science Applications International Corporation
Las Vegas, Nevada

Prepared by a Nevada Nuclear Waste Storage Investigations (NNWSI) Project participant as part of the Civilian Radioactive Waste Management Program. The NNWSI Project is managed by the Waste Management Project Office of the U. S. Department of Energy (DOE), Nevada Operations Office. NNWSI Project work is sponsored by the Office of Geologic Repositories of the DOE Office of Civilian Radioactive Waste Management.

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CHAPTER 1

INTRODUCTION

The purpose of this paper is to outline a variety of methods that could be used by the Nevada Nuclear Waste Storage Investigations (NNWSI) Project to assess the attitudes of Nevada citizens toward the location of a repository at Yucca Mountain. The paper is divided into three chapters: Chapter 1 provides a background discussion; Chapter 2 discusses different social science methods and summarizes the advantages and disadvantages of each; and Chapter 3 outlines a conceptual approach to integrating several methods into one overall strategy for assessment.

An assessment of the attitudes of persons who may be affected by repository activities will: (1) enhance the NNWSI Project's ability to conduct the social impact assessment that can be included in an Environmental Impact Statement (EIS); (2) provide an information base for understanding and anticipating public responses; (3) allow the NNWSI Project to scope and prioritize issues that arise in the public debate that may occur over the repository location; and (4) help to facilitate communication and cooperation between the U.S. Department of Energy (DOE) and State and local entities in the process of conducting the study.

Chapter 1 includes an outline of the concept of attitude, a discussion of the social context of risk perception, the implications of the findings on risk perception for the study of attitudes toward the repository, and a list of information needed by the NNWSI Project.

1.1 ATTITUDE THEORY

Broadly defined, attitude theory includes the three related concepts of attitudes, beliefs, behavior and their underlying value system (for critical discussions of the development and different branches of attitude theory, and of attitude and opinion measurement, see McGuire, 1985; Schlegel and DiTecco, 1982; Dawes and Smith, 1985). The three concepts represent, respectively, the affective, cognitive, and conative components of attitude structure. Narrowly defined, an attitude refers to feelings and emotions toward a particular event, object, or class of objects. A belief represents an assessment of what a person thinks is true or false--that is, his or her perception of past, present, or future reality (Dillman, 1978). Behavior can be viewed as comprising both planned and actual responses, or of tendencies toward action (Eysenck and Wilson, 1976). Values, which are more comprehensive and abstract than attitudes (narrowly defined) or beliefs, provide a basis for interpreting the world. In the words of Rokeach (1973), a value is "a standard that guides and determines attitudes toward objects and situations, ideology, presentation of self to others, evaluations, judgments, comparisons of self with others, and attempts to influence others."

The study of attitudes, beliefs, and values is an important component of the overall social impact assessment process for several reasons. First, assessment of impacts cannot be conducted at the objective level only. The objective situation affects an individual through his/her perception of it; therefore, assessment must include an assessment of the meaning of change to the persons concerned. Second, social impact assessment examines the distributive nature of impacts and should take into account the fact that people perceive, experience, and value things differently. Third, social impact assessment is an interactive process. People talk back. They can participate in and change the direction and degree of the expected impact. Willingness to accept change is a critical aspect of the assessment, that is based on people's attitudes, beliefs, and values.

The relationship between attitudes and behavior has been a major focus of research in social psychology (see, especially, Zanna and Fazio (1982) for a discussion of three distinct historical generations of research; a selection of additional relevant publications is included in the bibliography section of this report on attitude theory and measurement). The first generation of researchers concluded that attitude (used as the sole predictor) has only a "small to moderate" effect on subsequent behavior (Schuman and Johnson, 1976).[1] A second generation of researchers has focused on refining methods of measurement (see especially, Fishbein and Ajzen, 1975; Ajzen and Fishbein, 1980) and on identifying a variety of intervening, and interacting, variables that may affect the strength of the attitude-to-behavior relationship (Cooper and Croyle, 1984). These include what Sherman and Fazio (1983) call "person factors" (e.g., self-monitoring, self-image as a doer, and concern with making a good impression) and "situation factors" (e.g., normative influences of family and peers, attributes of the attitude under study, and context). Finally, and more recently, research in this area has begun to focus on the question of how attitudes guide behavior: Sherman and Fazio (1983), for example, have proposed a process model in which attitudes are placed within a general social cognitive framework involving the organizing and structuring of objects in the environment.

Early attitude research placed emphasis on the measurement of evaluative responses to objects and on the development of unidimensional attitude scales. The scales would assign numerical values indicating a respondent's position with respect to the attitude and included the Thurstone (equal interval), Likert (summated), and Guttman (cumulative) scales. More recently, emphasis has been placed on assessing the multiple factors that will determine responses to a proposed event. Introduction of the computer, which has permitted the widespread use of multivariate techniques, has enhanced the researcher's ability to explore the patterns within, among, or between clusters of variables.

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[1] See also Wicker (1969),for a frequently cited review of research that had accumulated since LaPierre's early, 1934, challenge to the existence of an attitude to behavior relationship; for evidence of the stronger behavior to attitude relationship see Festinger (1957); Festinger and Carlsmith (1959); Kiesler, Nisbett and Zanna (1969).

Multivariate statistical techniques hold great promise for revealing some of the complexities of the relationships among attitudes, beliefs, behavior, and values. Attitudes toward the proposed repository will not develop in a vacuum but will be based on existing attitudes, beliefs, experience, and values that incorporate both standard and special aspects of repository development. Standard aspects are related to worker inmigration and community growth and change issues; special aspects are related to the radiological aspects of the facility. Through the use of factor analysis, it may be possible to reduce the multiplicity of attitudes and beliefs to a smaller, more manageable number of key beliefs and attitudes that are determinants of overall attitude toward the repository. In addition, the analysis should indicate the distribution of key beliefs and attitudes among population groups and the likelihood and magnitude of responses for particular groups. For example, previous research on attitudes toward construction of a power plant in Tennessee has indicated that perception of economic benefits and of hazards to health and the environment were two of the primary clusters of beliefs related to overall attitude toward the plant (Sundstrom et al., 1977; Lounsbury et al., 1983)[2].

Testimony given at the public hearings (DOE/NVO, 1983) and comments on the Yucca Mountain Draft Environmental Assessment (DOE, 1984) show that these are also major issues of concern in Nevada. More specific information regarding the relative importance of these and of other issues, together with their distribution among the Nevada population, would provide valuable information for the assessment of social impacts.

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[2] In this study, the researchers performed a principal components factor analysis on an original list of 27 possible important effects of plant construction and operation. Five clusters of beliefs (factors) emerged, each of which was correlated with overall attitude toward the plant. These were: disruptive effects of growth, hazards to health and the environment, increased business and development, outside attention and recognition, and economic benefits of growth. A stepwise multiple regression analysis showed that hazards and economic benefits accounted for 52 percent of the variance in overall attitude toward the plant. A similar study undertaken in Austria concerning public beliefs about nuclear power in general, reduced these beliefs to four factors: economic and technical benefits, psychological risks, environmental and physical risks, and sociopolitical risks. The largest contributors to positive attitudes toward nuclear power were the two factors of economic and technical benefits, and environmental and physical risks. The largest contributors to negative attitudes toward nuclear power were psychological and sociopolitical risks (Otway, Maurer and Thomas, 1982). A related study showed that Austrian policy makers underestimated the public's negative evaluation of psychological risks and also the public's belief that the use of nuclear energy would lead to such risks (Thomas et al., 1980).

1.2 THE SOCIAL CONTEXT OF RISK PERCEPTION

Because of the special aspects of attitudes toward the repository, recent findings in the body of literature known as the risk perception literature are especially relevant to the NNWSI Project. They are summarized in the following discussion.

There has been considerable debate concerning the way in which risk is perceived. Recent contributors to the risk perception literature have emphasized its subjective nature and its political, ethical, and equity dimensions. These contributors include von Winterfeldt and Edwards (1984); Otway and Thomas (1982); Otway and von Winterfeldt (1982); Covello, Menkes, and Nehnevajsa (1982); Douglas and Wildavsky (1983); Thompson (1982a,b); Gross and Rayner (1985); Rayner (1984).

Otway and Thomas have concluded that there are two basic approaches to risk perception. One approach views risk as an objective, quantifiable attribute of technologies and natural hazards; an alternative approach views risk as a social process, a socially constructed view of the world (see also, the distinction made by Covello, Menkes, and Nehnevajsa, 1982, between the "generation of probabilistic data by experts and the interpretation and meaning that individuals attached to such data.") Whereas aggregate data used in earlier studies concealed the heterogeneity of risk perception, current social science theories provide valuable insights into its nature. For example, sociologists and cultural anthropologists have concluded that different segments of the population construct reality differently and in accordance with their diverse experience of social organization. Thus, perception of risk can be understood better when treated as only one aspect of a constituency's collective world-view--that is, its way of relating to the social and physical environment.

Cognitive psychologists offer equally important insights in their explanation of the process of risk perception within the framework of the way in which individuals select, edit, and integrate stimuli from their environment according to their needs at that particular moment. The conclusions of psychologists provide an explanation for the different models of risk held by experts and the lay public, respectively.[3] These differences may be of particular significance for implementation of the NNWSI Project plan:

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[3] Studies have shown that a difference exists between the way experts (in their field) and lay people judge risk. Experts' ratings of various activities and technologies correlate highly with technical, or statistical, calculated frequencies of death; laypersons' judgments are not closely related to their own, or to experts', estimates of annual fatalities. The latter ratings are determined not only by unidimensional statistics, but by a variety of quantitative and qualitative characteristics. These include: a hazard's degree of controllability, the dread it evokes, its catastrophic potential, and the equity of its distribution of risks and benefits (Slovic, Fischoff, and Lichtenstein, 1982).

> The studies which come closest to explaining (as opposed to describing) the so-called biases and irrationalities of lay publics are those which relate behavioral observations to wider processes whereby information is selected and integrated alongside representations of the world already held by the subject as a result of earlier experiences, and motivations ranging from preferences to life directing goals...the value of a future outcome is judged, not in terms of final assets, but with reference to gains and losses from some subjective reference point (Otway and Thomas, 1982).

A noteworthy feature of the past two decades has been the emergence of controversy over scientific and technological decisions that were once defined as technical, i.e., within the province of experts, which have become increasingly political (Nelkin, 1979). In particular, the risk and equity characteristics of technical decisions have been the subject of increasing debate, and the polarization of attitudes that has frequently occurred has made conflict resolution extremely difficult. Social impacts, such as political, legal, and organizational changes, have resulted from the attitudes and behavior of opposing citizens, affecting the successful implementation of policy and adding to the cost of technology implementation.

In their discussion of polarization and patterns of group conflict about risky technologies, von Winterfeldt and Edwards (1984) conclude that characteristics of a technology will permit judgment of the risk aspects. However, prediction of the nature of polarization involves an understanding of social, ethical, and political concerns also. As ethical issues become more important, the conflict tends to oscillate between discussions of facts and of values, and it tends to become less amenable to negotiation (von Winterfeldt and Edwards, 1984). These authors suggest that the key to resolving conflict may not be the conduct of more sophisticated analyses; rather, the key may lie in the creation of political and institutional mechanisms of participation for concerned publics that will permit both an interchange of viewpoints and an opportunity for consensus building.

Research on risk perception has pointed to the key role played by belief in the legitimacy of the processes of decision making in the acceptance of risk. For example, recent research indicates that incentives may help achieve the twin goals of increasing local support and decreasing opposition to the siting of waste facilities. The incentives may be both economic in nature (mitigation, compensation, reward) or designed to enhance citizens' feelings of control (independent monitoring and access to information) (Carnes et al., 1983).

1.3 IMPLICATIONS FOR THE STUDY OF ATTITUDES TOWARD THE REPOSITORY

The findings on risk perception have important implications for the guiding principle of the study of attitudes and therefore apply to the selection of suitable methods and for specific questions asked by the researcher. The principle that guides the study should be the development of an understanding of the way in which different segments of the population view their world and how that viewpoint may relate to repository activities.

Although there is a growing body of literature and aggregate data related to nuclear waste concerns that serve as valuable background (see especially the literature from the Battelle Human Affairs Research Center), it is the unique characteristics of the overall impact area and of Nevada communities and their residents that require exploration. What are the values, historical development, and social and economic characteristics of the residents? What has been their experience with nuclear affairs and how may they perceive the benefits and costs of waste repository location activities? What particular concerns do the residents have regarding the location of a repository at Yucca Mountain? Are the concerns related to technical issues only, or do they extend to the decision making process? What are the views on ways in which the NNWSI Project can respond to the residents' concerns?

Differences in attitudes are likely to occur both among and within communities in southern Nevada. Factors that may be related to these differences, and that require exploration, include differences among communities in terms of population size and composition, distance from the proposed site, economic base, proximity to transportation routes, and acceptance of nuclear technology. For example, attitude development among residents in small rural communities located near the repository site may be less influenced by apprehension of nuclear technology, with which they are familiar because they reside near the Nevada Test Site, and more influenced by the perceived potential for (standard) effects on personal and community quality of life. In these areas, factors such as the value placed on economic growth or the possibility of additional employment opportunities could be important indicators of likely attitudes. However, these factors will probably not influence the attitudes of residents in small rural communities in eastern and southern Clark County, that are distant from the site, and the urban Las Vegas area with its existing large and diverse population base. Attitudes in the latter areas may be more related to the special aspects of repository development, such as apprehension concerning proximity to transportation routes, or the perceived effect of repository location on the tourist industry that constitutes the area's economic base. These types of attitudes, which may result in the most significant social impacts overall (National Research Council, 1984) are likely to cross jurisdictional boundaries and will require particular consideration.

1.4 THE NNWSI PROJECT INFORMATION NEEDS

Data on the study area are limited. Work is in progress to develop data on existing social and economic characteristics of communities surrounding the Yucca Mountain site. The present report suggests ways of identifying characteristics which could affect the way in which repository activities are viewed.

Answers to the following questions would provide a basis for the analysis of attitudes toward the Nevada Nuclear Waste Storage Investigations (NNWSI) Project:

1. What is the economic base of the community?

2. What are the most valued attributes of residents' communities and current lifestyles?

3. What do residents know about the NNWSI Project? How much do they understand about radioactive waste?

4. What have been citizens' previous experiences of nuclear installations and activities?

5. What are the perceived benefits and concerns about repository activities?

6. Overall, do citizens support or oppose the NNWSI Project?

7. What is the strength of citizens' attitudes? In particular, do measures of intensity, centrality, and intention (commitment to action) indicate the possibility of attitudes being translated into active political involvement (either supporting or opposing the repository)?

8. What can be done to address concerns? Is there any indication that acceptance of the repository would be affected by the opportunity to participate in or to affect the structure of decision making for particular issues of concern?

9. Are there differences in attitudes, beliefs, and intentions among segments of the population? Which segments differ, and what is the social basis of these differences?

10. Is it possible to identify a small number of key items (for example, beliefs, concerns, related attitudes) that would predict overall attitude toward the repository? How are these related to the underlying value systems of individuals and collectivities?

CHAPTER 2

ATTITUDE ASSESSMENT METHODS

Chapter 2 discusses a variety of methods that can be used to assess attitudes held by residents of the study area toward the repository. No one method used alone can capture the entire complexity of social phenomena. Therefore, the goal of the study plan should be the integration of a variety of methods to capitalize on their relative strengths. This issue and a suggested combination of methods is discussed in greater detail in Chapter 3.

The chapter is divided into eight sections. Section 2.1 explains the basic distinction between quantitative and qualitative analysis. Section 2.2 provides a list of the general criteria by which different methods can be evaluated. Sections 2.3 through 2.8 discuss various methods. For each method, the goal is outlined and then the method and its primary advantages and disadvantages are described briefly.

2.1 THE DISTINCTION BETWEEN QUANTITATIVE AND QUALITATIVE METHODS

Methods discussed can be classified as either quantitative or qualitative. Quantitative analysis is defined as the numerical representation and manipulation of observations used to describe and explain the phenomena that the observations reflect; qualitative analysis is the non-numerical examination and interpretation of observations used to discover underlying meanings and patterns of relationships (Babbie, 1986).

Quantitative and qualitative methods should be viewed as complementary rather than as alternative ways of studying social phenomena. Each type of method has particular strengths. Typically, quantitative analysis has greater scope, while qualitative analysis has greater depth (Katz, 1953; Vidich and Shapiro, 1955). In research on attitudes, quantitative data may be developed through methods such as the sample survey that are designed to aggregate responses and be representative of a larger population. The numerical data from the survey may be presented as manageable summaries of the distribution of specified variables among the population under study and of the association among the variables (descriptive statistics); statistical analyses and manipulation of the data will permit explanation of the relationships among the variables (inferential statistics). Qualitative methods such as participant observation, unstructured interviews, and discussions disaggregate responses and permit the researcher to observe attitudes in a natural setting and obtain an understanding of their context, dynamics, and meaning. They are guided by a holistic, phenomenological approach that seeks a comprehensive understanding of human behavior from the actor's own frame of reference (Bogdan and Taylor, 1975).

2.2 CRITERIA FOR METHOD SELECTION

Some of the general criteria by which different methods can be evaluated include:

1. Efficiency of the method for achieving the stated goal
2. Representativeness of the results
3. Reliability and validity[4]
4. Precision
5. State and local participation
6. Degree of intrusion into citizen's lives
7. Practical considerations, such as timing, complexity, or simplicity
8. Difficulty in adhering to regulations of the Office of Management and Budget (OMB)[5]
9. Availability of resources, dollars, and expertise.

Methods discussed in the following sections include content analysis, key-informant interviews, participant observation, network analysis, sample surveys, and a variety of group methods.

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[4] Reliability refers to consistency between independent measures of the same phenomenon; it requires that the same measures used by different researchers and/or at different times produce the same results. Validity is defined as the degree to which the researcher measures what he/she intended to measure; it involves both validity of measurements and validity of findings. Validity of measurement requires that the measure used accurately reflects the concept it is designed to measure. Validity of findings includes both internal validity (did the methods used make a difference to the specific results?) and external validity (how generalizable is the study?) (Smith, 1975; see also Campbell, 1957, 1969; Campbell and Stanley, 1963).

[5] The Office of Management and Budget, acting pursuant to the Paperwork Reduction Act, has issued a directive entitled "Controlling Paperwork Burdens on the Public," codified at 5 CFR 1320.1-1320.20. Generally, these regulations require that Federal agencies obtain OMB approval prior to engaging in a "collection of information." Use of standard questionnaires and identical questions would constitute such a collection.

2.3 CONTENT ANALYSIS

Content analysis has been defined by Holsti as a technique for making inferences by objectively and systematically identifying specified characteristics of messages (Holsti, 1969).

2.3.1 GOAL OF CONTENT ANALYSIS

Berelson (1954) has identified seventeen types of use of content analysis. Two uses that would be appropriate for the NNWSI Project are analysis of newspaper content and analysis of public comments.

In a study of an entire region, newspapers could be selected from different localities to obtain representative coverage and to indicate differences in viewpoint among sectors in the region. Some of the most relevant purposes for which content analysis could be used in the context of attitudes toward the repository at Yucca Mountain are: (1) to study the image of the repository that is presented; (2) to examine the accuracy of information content regarding the repository; (3) to indicate the relative importance of the repository as a news item; (4) to identify the existence of stakeholder groups, the issues raised, attitudes and values revealed, by group; and (5) to monitor changes that occur in the activities and issues raised by groups.

In addition to studying media content, analyses could be undertaken of public comments as is done by the U.S. Forest Service by means of the computerized Codinvolve system (Clark and Stankey, 1976). Material can be compiled, on a continuous basis, from transcripts of public hearing testimony and other public meetings, from interactions as recorded in file menus and from trip reports and correspondence. The goal of this type of data analysis is to identify the values, attitudes, and information level of key stakeholder groups.

A less formalized version of content analysis can be used to abstract pertinent information from local newspapers concerning social life in study area communities. These data can be combined with available published data on the study area to develop preliminary community profiles and a background understanding of the world-views of community residents.

2.3.2 DESCRIPTION OF CONTENT ANALYSIS

Data are systematically coded by subdivision into units of measurement and categories. The unit may be a word or a phrase. For example, in qualitative analysis, material may be coded according to major theme, such as sacrifice or equitable distribution of risk. In quantitative analysis, material could be coded according to the frequency with which value-laden words such as clean, safe, dirty, dangerous are used, or according to the presence or absence of a specified attribute. Alternatively, the researcher could use a space measure such as the column inch, lines or paragraphs devoted to a subject. (The latter may be particularly useful for indicating the importance of the repository as a news item). Units are subsequently categorized.

An example in the case of attitudes would be unqualified support, qualified support, a neutral attitude, qualified opposition, or unqualified opposition toward the repository.

2.3.3 ADVANTAGES AND DISADVANTAGES OF CONTENT ANALYSIS

2.3.3.1 Advantages of content analysis

The method scores highly in terms of practical considerations, availability of data sources, and lack of intrusion into citizens' lives. Holsti has pointed to the suitability of content analysis for several types of research problems. These include a lack of access to persons who are the real subject of study, the need to use unobtrusive measures that will not affect the phenomena being studied, and situations where the analysis is part of a "multiple operation" intended to approach a problem from a variety of angles so that confidence can be increased in one's interpretations (Holsti, 1969).

Content analysis is a particularly useful means of identifying the values and attitudes of key stakeholder groups. Although their views may not be representative of the entire area public, an understanding of them provides insights that are needed for estimating the potential for community controversy and polarization. In addition, content analysis of the source or accuracy of information and of the image and relative importance of the repository would be of value for discerning the quality of information that is transmitted formally through the mass media.

Less formalized content analysis of local newspapers can provide valuable information about social and organizational activities, the institutional structure, local history, major controversies and concerns, stakeholders' groups, influential community leaders, and residents. The information is valuable for providing a background understanding of the world-views of community residents and for identifying potential key informants (see below) or issues/data to be verified or examined in subsequent research.

2.3.3.2 Disadvantages of content analysis

The major disadvantage of content analysis, when applied to the study of attitudes, is that it does not study attitudes directly. Rather, the content of the data is viewed as reflecting public attitudes. This material may not be representative of total community views. (All that can be said with certainty is that it quantifies editorial bias in the selection of what is considered newsworthy.)

A study by Ludtke, that compared the findings of content analysis and survey data concerning attitudes toward energy development in southwestern North Dakota, concluded that content analysis was substantially inferior to survey methods in this context. The twelve attitudinal variables that were examined included items typically included in baseline attitudinal data. Examples are: attitudes toward coal industrial development, attitudes supportive of activities, valued natural and social features, identification with place and satisfaction with life. Content analysis was judged to be an inefficient and

inaccurate method for measuring public responses because of its vulnerability to bias through self-selection among authors of both articles and letters to the editor (Ludtke, 1978).

2.4 KEY-INFORMANT INTERVIEWS

As the name suggests, key-informant interviews involve the interviewing of community members who may be expected to have inside knowledge of their communities. The method was introduced by anthropologists. Typically, the researcher develops an intensive, long-term relationship with "an articulate, willing, and verbal" informant or informants who could report on past or existing cultures (Mead and Metraux, 1953). In living communities, the method is frequently used in combination with participant observation so that the researcher can check informant accounts and gather clues for further questions. Sociologists who adopted the method include: Hunter (1953), who used informants to describe community structural relations, Campbell (1955), and Seidler (1974), who used structured interviews as the basis for an analysis of organizations. Finsterbusch (1977) has characterized key-informant interviewing as "the backbone" of social impact assessment.

2.4.1 GOAL OF KEY-INFORMANT INTERVIEWS

The key-informant interview provides background for attitudes and perceptions research, leading to a deeper understanding of the primary social characteristics of a community than that provided by secondary data sources. It permits identification of data about community attitudes, values, and lifestyles, of community opinion leaders and community leadership characteristics, and of the major social groupings and divisions that will require further investigation. The process enhances the researcher's understanding of the frames of reference of the residents.

2.4.2 DESCRIPTION OF KEY-INFORMANT INTERVIEWS

Community leaders, whom one would expect to be knowledgeable about their community, can be identified by a positional or a reputational approach. The latter may or may not include snowball sampling, which is described later in this section. In small communities, the same persons are likely to be identified, regardless of approach (Branch et al., 1984).

In the positional approach, which was used by Seidler (1974) and Campbell (1955), informants are selected according to the structural position they occupy in the organization or community under study. For a community analysis, a list would be prepared of persons who are in appointed or elected leadership positions. Examples are: town council or planning board member, school superintendent, or church leader. Informants would be selected by random sampling or by a predetermined formula designed to ensure representation of divergent perspectives.

The reputational approach to identifying informants seeks to avoid the problem of missing knowledgeable community residents who are not in formal leadership positions. Therefore, key informants are identified on the basis

of their reputed knowledge of the community (Hunter, 1953; Sanders, 1960; see also the identification of community influentials by Laumann and Pappi, 1973). Initially, contact is made with two or three known leaders who are interviewed and also asked to name eight additional persons who are knowledgeable about the community. (The process assumes that the research team has no prior knowledge of a community, although in many cases some informal contacts already may have been made.) After two or three interviews, a tabulation is made of the persons who are mentioned most frequently and interviews are held with them. Although there is variation among communities in the frequency with which the same names are given, previous studies have shown that a core group of frequently mentioned names emerges very soon (Sanders, 1960). Snowball sampling constitutes a specific variation of the reputational approach. The technique involves following a chain of referrals from the initial contacts and requires that the investigator "actively and deliberately develop and control" the selection process in accordance with his/her research needs (Biernacki and Waldorf, 1981).

All interviews are conducted on an individual basis by trained interviewers who introduce broad discussion topics. Questions are open-ended and the interview is designed to maintain spontaneity of response. The following topics are included: (1) data about the key informant; (2) historical background of the community, including the cultural origin of inmigrants and the dominance of particular livelihoods and technologies; (3) previous community experience of development and change; (4) primary social groupings, their patterns of formal and informal interaction; (5) major changes currently occurring within the community, recent issues that have arisen, and significant divisions and primary opinion leaders in these areas; (6) most valued attributes and chief problems of the community; (7) general attitude toward community growth and change; and (for the snowball approach) (8) a listing of persons considered to be knowledgeable and the reasons for each selection. The original list of informants should be extended to include spokespersons for significant social groupings that are identified during the interview process, thereby permitting the identification of group similarities and differences.

Ideally, several interviewers are used in conducting the interviews in an effort to control for interviewer bias. Although this approach loses the advantage of a single reference point and thus uniformity of bias, it provides an opportunity for cross-checking among interviewers' reports. Cross-checking may occur in two ways: (1) two persons may attend each interview, with one person asking questions and the other taking notes. Interviews are scheduled so that there is adequate time for the interviewers to cross-check and clarify notes and interpretations immediately after the interview; or (2) several interviewers are used. They interview alone, but cross-check findings from each community. These techniques may be particularly advisable for use on controversial and politically sensitive projects. Following the completion of the fieldwork, the research team meets to cross-check and prepare a community profile that will permit comparisons with other communities. Differences in viewpoint or inconsistencies in data will require reexamination or follow-up.

2.4.3 ADVANTAGES AND DISADVANTAGES OF KEY-INFORMANT INTERVIEWS

Key-informant interviews can achieve the desired research goal and meet the criteria listed in Section 2.2. However, some criteria can be more easily met than others and particular strengths and weaknesses are outlined in the following sections.

2.4.3.1 Advantages of key-informant interviews

Key-informant interviews represent an efficient means of achieving the desired goal. They are of particular value for providing understanding of the social characteristics and organization of a community, and of the world-view of community residents. They can thus provide information on a variety of social phenomena that are not available from published data sources and/or are not directly measurable. These data are useful in developing community profiles and in identifying issues to be examined in sample surveys. Although key-informant interviews cannot claim to provide a statistically valid, representative, sampling of explicit community attitudes and values, as in the case of the survey, they permit identification of the distribution of community power and interest that may prove to be comparatively superior predictors of actual events.

Other advantages of the key-informant interview include economical use of time and resources, high response rate, and meeting of practical considerations, such as relative simplicity and flexibility of timing. The method provides an opportunity for local involvement. If adequate preparations and explanations are made in advance to community leaders, county executives, and State personnel, local leaders may welcome the opportunity to be interviewed and consulted. Because of the range of insights that are generated, key project personnel can benefit greatly from involvement in conducting the interviews.

2.4.3.2 Disadvantages of key-informant interviews

The criteria of representativeness, validity, and reliability may cause problems. Particular care must be exercised in developing a list of potential interviewees such that a cross section of groups and perspectives can be obtained. Vidich and Bensman (1954), have identified several sources of misinformation that can invalidate results. These disadvantages, the first two of which apply equally to other forms of interviewing, include: (1) purposeful intent to misinform, stemming from the desire of the informant to influence the results of the research or to deny the existence of problems or local taboos; (2) the interaction of personalities between interviewer and informant, including the informant's image of the research project and of the interview (see also, Merton, 1947); and (3) the inability of the informant to fulfill the role of the ideal "articulate, willing, and verbal" informant (Mead and Metraux, 1953). As Zelditch has emphasized, the informant must be in a position to know the information requested; he or she cannot be expected to know if the structure being studied is highly differentiated or if the required information is private as in the case of attitudes and beliefs (Zelditch, 1962).

These problems could be particularly serious if the key-informant interviews were used as the sole source of information. However, information obtained from an informant should be evaluated in terms of its contribution to the whole picture and should be cross-checked with other data. For example, in its original context, the key-informant process involved a long-term relationship between anthropologist and informant that permitted the anthropologist to take into account the informant's bias; also, key-informant interviews were frequently combined with participant observation so that cross-checking of information could occur. In the context of the NNWSI Project, data obtained from informants on social groupings, attitudes, and values can be cross-checked with data obtained from focus groups and from the sample survey. (See also Sieber, 1973, for a discussion of the advantages of a combined stategy of field work and survey methods.)

2.5 PARTICIPANT OBSERVATION

Participant observation, the method used for many years by anthropologists, has been adopted by sociologists (Friedrichs and Ludtke, 1975; see also Gold, 1958; Whyte, 1955; Lofland, 1971). The participant observer lives in an area and studies a culture from within by continuous observation and participation in its affairs. The researcher is thus at once a participant and an observer (Murdock, Thomas, and Albrecht, 1982). This approach differs from that of the observer who approaches a culture from outside by using the technique of interviewing.

2.5.1 GOAL OF PARTICIPANT OBSERVATION

The primary goal of participant observation is to obtain direct understanding of an area through the actual experience of living in it. Essentially, the goal is to obtain, as nearly as possible, an insider's view of community life and to discover the processes of interaction that occur.

2.5.2 DESCRIPTION OF PARTICIPANT OBSERVATION

The researcher lives in the study area and participates in its daily life. As a participant, the researcher is able both to see and feel what is happening around him and can interpret the behavior of community members. He/she takes notes on social activities, formulates concepts and hypotheses, and tests them in the field. Participation can range from complete immersion in community affairs to acting as a spectator; the researcher may or may not reveal his identity and goals to the persons he is studying (Gold, 1958). This method was developed by anthropologists who typically combine data in their field notes from eyewitness observation and from informal conversations with community members. In its original context, participant observation involved the researcher living in the community for months or years; however, an extended time period would not be the norm in social impact studies.

2.5.3 ADVANTAGES AND DISADVANTAGES OF PARTICIPANT OBSERVATION

2.5.3.1 Advantages of participant observation

Participant observation can achieve its goal of providing a more thorough understanding of the study area than that which could be obtained solely through interview techniques. The human context provides an added depth of understanding that is both an invaluable foundation and continuing reference point for studies. It permits the researcher to frame his or her study within the frames of reference of the residents.

In addition to providing a deeper understanding of the area, participant observation allows the researcher to study attitudes in a natural setting. The natural approach permits the direct observation of what people actually do rather than what they say they do. It thus avoids the problem of non attitudes, or attitudes evoked by the interview setting alone and the problem of discrepancies that can occur between stated attitudes and actual behavior. Moreover, the method can enhance the reseacher's ability to accurately access baseline values and facilitates an awareness of the social processes and dynamics that lie at the root of the process of attitude formation.

Finally, as emphasised by Murdock, Thomas, and Albrecht (1982) the method is valuable for the flexibility it provides. The researcher can adapt his/her study on a continuous basis, as circumstances change, as new evidence is obtained, and as new insights are developed. It permits him/her to pursue new ideas; to identify variables and relationships among variables about which he/she may not have thought to ask; and to detect latent phenomena (observed activities whose meanings may not be clear to the participants).

2.5.3.2 Disadvantages of participant observation

Generally, major problems encountered in participant observation stem from difficulties in achieving validity, reliability, and representativeness and from the exposed and intense nature of the research process itself. Murdock, Thomas, and Albrecht (1982) have distinguished five specific weaknesses of the method: (1) loss of detachment/perspective, (2) problems of reliability and validity, (3) direct exposure of the researcher, (4) floundering, and (5) the intensity of the research process.

Although participant observation is invaluable for providing depth of understanding, it is not the most efficient for covering a wide geographical area, nor is it the most complete for assessing a cross section of attitudes. The southern Nevada area contains both a rural section and a highly differentiated urban section. Physical limitations will prevent the observer or observers from being aware of all relevant attitudes and perceptions and it is impossible to estimate in quantitative terms the representativeness of the findings. Validity and reliability pose particular difficulties because the nature of the method is such that the data are inherently nonreplicable and difficult to verify. Selective perception can easily occur. One of the most frequently cited problems is loss of detachment. The observer may suffer from over-identification with the persons being studied, succumbing to the tendency to "go native." Equally, he/she may tend to confuse the part for

the whole, basing conclusions about the whole community on the views of an unrepresentative group of spokespersons (Murdock, Thomas, and Albrecht, 1982).

A particular disadvantage of participant observation, which is also highlighted by the latter authors, is that it places the researcher in an uncomfortable marginal role of being both participant and observer. He/she occupies a very exposed position in which researcher and instrument are integrally related and thus lacks the security of standard research tools with a fixed format and schedule.

2.6 NETWORK ANALYSIS

Analysis of social structure constitutes the focus of network analysis. The concept is graphically described by Barnes (1954):

> The image is of a set of points some of which are joined by lines. The points of the image are people, or sometimes groups, and the lines indicate which people interact with each other. We can, of course, think of the whole of social life as generating a network of this kind.

2.6.1 GOAL OF NETWORK ANALYSIS

Network analysis abstracts the pattern or system (network) of social relationships among individuals or groups with a view to interpreting the social behavior of the persons or groups involved. It strives to explain both continuity and change within relational systems by mapping patterns of activities, reciprocity, and expectations that link the actors together. Network analysis provides a method for understanding both formal and informal social systems.

2.6.2 DESCRIPTION OF NETWORK ANALYSIS

Network analysis is a quantitative method within which two basic approaches can be distinguished: the individual graph-theoretic approach and the global block-model approach (Mandel, 1983). The individual approach analyzes a specific set of linkages among individuals with particular emphasis on their connectivity and density. The global approach divides the population into blocks (or groups) of persons who share similar patterns of relationships relative to other blocks.

Grid/group analysis (Douglas, 1978, 1982; Douglas and Wildavsky, 1983; Rayner, 1984; Gross and Rayner, 1985; Thompson, 1982) constitutes a distinct variant of network analysis which is of particular relevance to the Nevada Nuclear Waste Storage Investigations (NNWSI) Project. This type of analysis provides a framework for relating the structure of social organization to cultural patterns, or patterns of ideas and values. Differences in ideas and values including the perception of risk, are thought to be systematically related to differences in social organization, as defined by particular

combinations of grid and group scores. Thus, risk is judged within a cultural context; attitudes toward risk are an integral part of the way that a community of persons makes sense of the world and, according to grid/group analysis, are measurably the same across all cultural settings. The application of grid/group analysis to the NNWSI Project lies in its method of classifying the likely behavior and attitudes of specific social groups and explaining their interpretation of risk. Different social organizations rely on different principles for recognizing a risk and for assigning to the risk different liabilities and benefits that arise.

In the Gross and Rayner model, grid and group are graphically presented as vertical and horizontal coordinates respectively. Grid refers to the degree of strength of the categorical distinctions, as in offices, rank, status, or position in a hierarchy. The high or low strength of grid is determined by the extent to which categorical distinctions limit the range of social choices or activities open to people. Primarily, grid is high when positions are ascribed, or distributed on the basis of explicit culturally defined attributes, such as sex, color, descent in a lineage, seniority, etc. With high grid there is typically a distinct division of responsibilities with accompanying expectations, rules, and regulations about behavior. A low-grid network is one in which categorical distinctions in a group are based on achievement, merit, or personal abilities. Low grid is characterized by more individuality, more ambiguity of expectations, and fewer constraints on behavior than high grid.

Group represents the degree to which the behavior of members depends upon their membership in a particular group (see also Hechter, 1983, for a related discussion of ways in which group solidarity is maintained). A high-group network would be characterized by definitive group boundaries, strong commitment, and solidarity. Conversely, a low-group network would be one with weak group boundaries and loosely defined ties among members. The intersection of the coordinates produces four quadrants, each of which represents a particular type of social organization: high grid/high group (hierarchical, bureaucratic, with structured rewards); high grid/low group (strongly regulated according to socially assigned classifications, termed "atomized suborination" by Douglas); low grid/high group (egalitarian sects); and low grid/low group (individualistic). This typology provides a means of classifying the likely behavior and attitudes of specific social groups and a means of understanding their interpretation of risk. The values of the grid/group dimensions are calculated with the aid of the EXACT computer model developed by Gross and Rayner. The required data are obtained by participant observation.

2.6.3 ADVANTAGES AND DISADVANTAGES OF NETWORK ANALYSIS

2.6.3.1 Advantages of network analysis

Network analysis provides a precise means of delineating relationships within a social context and a fruitful way of hypothesizing the correlation between forms of social organization and cultural patterns. It conceives of social structure in a dynamic sense, rather than as a static phenomenon, giving attention to both social change and stability within the system.

Although complexity and resource constraints may prevent the adoption of formalized network analysis, an awareness of the method and its goals (including, in particular, Barnes' conception of social life in terms of networks of interaction) provide valuable insights. Grid/group analysis, in addition, provides a road map for the investigator in formulating an approach to the analysis of social structure and the examination of the relationship between social organization and attitudes, beliefs, and values. This road map can be used in interpreting the data from key-informant interviews and focus groups and to estimate likely patterns of group response to repository construction and operation.

2.6.3.2 Disadvantages of network analysis

Resource constraints present a major problem for the implementation of all types of network analysis. The mathematic calculations are complex and prolonged periods of participant observation are required to supply the necessary data. In addition, a particular problem of grid/group analysis is that the method remains essentially untested. These practical disadvantages may combine to make implementation of the method difficult; use of the method may not be practical in the context of the NNWSI Project.

2.7 SAMPLE SURVEYS

Sample surveys involve the selection of a subset, or sample, of members from the total population. The method of selection permits the researcher to make inferences about the population being studied and to estimate the expected error in generalizing findings from the sample to the total population. This increasingly common and sophisticated process has been used extensively; and there is a considerable body of literature concerning this method (see Miller, 1977; Babbie, 1973; Smith, 1975, for standard textbook treatments; additional references for specific survey issues are listed also in the bibliography).

2.7.1 GOAL OF THE SAMPLE SURVEY

The primary goal of sample surveys in attitude assessment is to describe and compare the characteristics, attitudes, beliefs, and intentions of the potentially impacted population and its subgroups, and to predict responses to the project.

2.7.2 DESCRIPTION OF THE SAMPLE SURVEY

Sample survey designs vary in type of survey, size of the sample, sampling method, type of interview and questionnaire format selected, and sampling frame from which the sample is drawn. Issues involved in selecting the combination of features are outlined briefly in the following section. Many of the selections involve a trade-off between different factors, for example, information needs and resource availability.

2.7.2.1 Type of survey

Cross-sectional, panel, and trend surveys are three surveys that could be used in attitude assessment. The most frequently used is the cross-sectional survey that takes place at one point in time. Trend and panel surveys indicate changes that occur over time. Trend surveys study the same population but draw different samples on each occasion; panel surveys involve the selection of a sample of persons who are interviewed repeatedly at different points in time.

2.7.2.2 Sampling method and size of the sample

Different sampling methods are described in Table 2-1. The factors that affect the size of the sample include the selected sampling method, the required degree of confidence in the results, and the extent to which analysis of population subgroups will be required.

2.7.2.3 Types of questionnaire or interview schedule

Questionnaires may be mailed to respondents, or interviews may be conducted in person, or by phone. Primary factors to be considered include: (1) cost, quality control, and implementation time; (2) expected response rates; and (3) validity and reliability of the data. Selection of a particular method involves a balancing of these factors (see Frey, 1983, for a succinct review and summary table comparing mail, face-to-face, and telephone survey methods).

Individually mailed survey forms are less expensive, allow greater geographic coverage for a given cost than other methods, and are less likely to result in the incidence of socially desirable responses. However, a disadvantage is the higher rate of nonreturns compared with face-to-face or telephone interviews during which the interviewer can arouse the interest of the interviewee and increase the probability of participation[6]. Group administration or personal distribution of the questionnaires by a field worker represent attempts to overcome this problem. In addition, the absence of an interviewer may decrease the likelihood of obtaining valid, reliable data, as discussed in the following paragraph.

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[6] Dillman (1978) has proposed a variety of techniques for improving interviewer response in both mail and telephone surveys. His Total Design Method is based on a belief in the importance of attention to administrative detail and on a belief in the theory of social exchange. Application of the latter theory in survey research involves minimizing the costs of responding, maximizing the rewards for doing so, and establishing trust that the rewards will be delivered.

Table 2.1 Comparison of five primary sampling designs[a]

Sampling design	Description	Advantage	Disadvantages
Simple Random	A probability sample in which every member of the population has an equal chance of being selected. Population members are selected at random.	Requires minimum advance knowledge of the population. Estimation of errors is relatively straightforward; variability of estimates decreases as the sample size increases.	Does not make use of the knowledge that the researcher may have about the population under study. Larger errors for the same sample size than in stratified sampling.
Systematic	A probability sample in which every kth unit in a list is selected for inclusions in the sample. Typically the first unit is selected at random; k is computed by dividing the size of the population by the desired sample size, and is called the sampling interval.	Simplicity of drawing the sample; ease of checking. If the population is already ordered with respect to a pertinent property, it introduces a stratification effect and will reduce the variability, compared with a simple random sample.	If the list of elements is arranged in a cyclical pattern that coincides with a sampling interval a very biased sample may be drawn.
Proportionate Stratified	A probability sample in which population members are grouped into homogeneous groups (strata) prior to sampling. Members of the population are grouped according to whatever stratification variables are being used. Members are selected (either randomly or systematically) on the basis of the relative proportion of the population represented by a given group.	Assures representativeness with respect to the property which forms the basis for classifying the units. Therefore yields less variability than the above methods. Characteristics of each stratum can be estimated and comparisons made.	Requires accurate information on the proportion of the population in each stratum; otherwise it increases error. If stratified lists are not available, it may be costly to prepare them.
Cluster	A multistage probability sample in which natural groups (clusters) are selected at random. A complete count is taken of each group and a subsample subsequently taken from them.	Least costly method if clusters are geographically defined. Particularly advantageous if a new sampling frame has to be prepared. Requires the listing only of the individuals in selected clusters. Can be used for subsequent samples since clusters rather than individuals are selected. Substitution of individuals is permissible. This can be a particular advantage if a panel survey is planned.	Larger errors for comparable sample size than for other probability samples. Requires the ability to assign each member of the population uniquely to a cluster. Duplication or omission of population members may result if this is not possible.
Quota	A type of nonprobability sample in which members are selected into the sample on the basis of prespecified characteristics so that the total sample will have the same distribution of characteristics as are assumed to exist in the population being studied.	Reduces the cost of preparing the sample and of fieldwork. Incorporates special knowledge that the researcher may possess about the population being studied.	Introduces bias of the observer's classification of subjects and nonrandom selection within classes.

[a]Data from Babbie (1973); Miller (1977); Warwick and Lininger (1975).

Face-to-face interviews are the most expensive of the three methods. However, with the exception of the tendency to produce socially desirable responses, the personal interview offers several advantages for complex, controversial subjects. These include: the ability to ask complex, open-ended, or sensitive questions, to use visual aids, to probe and to clarify questions and answers, and to conduct longer interviews.

Telephone surveys are becoming the preferred method in many studies, primarily because of their efficiency and their relatively low cost. Groves and Kahn (1979) estimate that the cost of telephone surveys is approximately 45 percent less then the cost of field surveys. In addition, telephone surveys can be implemented more quickly than other survey methods and they provide an opportunity for better interviewer quality control and for immediate feedback between interviewers and coders. New developments such as computer assisted telephone interviewing (CATI) would increase efficiency (Freeman and Shanks, 1983). Telephone interviews also possess the advantage of an interviewer who can arouse interest, probe, clarify, and ask open-ended questions, although the ability to do this is reduced as compared with a personal face-to-face setting; also, visual aids cannot be used. In their comparison of telephone and personal interviewing, Groves and Kahn (1979) concluded that differences in response rates were small. Overall response rates, and partial and complete responses were slightly less for telephone interviews; there was also some indication that respondents were more suspicious and found the telephone interview experience less rewarding than a face-to-face interview.

2.7.2.4 Questionnaire format

Extreme care is required in the wording and ordering of questions on a questionnaire because slight differences may produce very different responses. However, the criticism of public opinion surveys voiced by Bourdieu (1973) should be noted. Neutral wording of questions may not result in unbiased answers, since in real life, a person's attitudes may crystallize through confrontation with opinions that have been stated by others. Thus, provocative questions may, in fact, produce a more realistic reflection of attitudes and their likely conversion into behavior.

A basic difference exists between closed or fixed questions and unstructured open-ended questions. Closed questions are less costly and less difficult to code than open questions and are less subject to interviewer bias in interpretation. However, for complex subjects they may not provide an appropriate set of alternatives that are meaningful to the respondent. In addition, they may reveal only whether the respondent favors or opposes an object, but not the reasons for the attitude, and they may elicit an answer even if no attitude exists (Kahn and Cannell, 1965; Schumann and Presser, 1981). A possible solution of this issue is to rely primarily on closed questions that have drawn upon the frames of reference of the residents and that have been thoroughly pretested (see especially Section 2.8.1.1 on exploratory focus groups), and to include additional items asking the reasons for a particular response.

2.7.2.5 Sampling frame

The sampling frame is a list of names from which the sample is selected. Therefore, the choice of an adequate frame is a fundamental aspect of the survey's representativeness.

Telephone surveys may draw on directories or use computerized random dialing. Use of the latter technique avoids the problem of unlisted and changed telephone numbers, although it may require the dialing of several numbers before locating a working household number. However, telephones may not be available in all households. This may bias the results because households without telephones have different characteristics from those with telephones. Telephone subscription is lowest among the poor and it is also low among blacks, rural persons, and those who rent a home (Groves and Kahn, 1979). The importance of the differences should be evaluated by each investigator; Kviz concludes that the reduction in bias is not worth the additional cost in most surveys (Kviz, 1978; see also Klecka and Tuchfarber, 1978).

If a mail or personal interview is adopted, additional sampling frames that could be used include: city directories, records of utility companies, tax rolls, directories of organizations, or voter registration lists. Each presents problems of ensuring adequate representativeness. A particular problem that may apply to all lists in an area such as Las Vegas, which is characterized by high population mobility, is that of obtaining a representative sample. A new list could be compiled by visiting the area and locating all dwelling units. This procedure, which would add to the cost, is explained in a report published by the Field Department of the National Opinion Research Center and cited in Sudman (Sudman, 1976; see also Wright and Tsao, 1982).

2.7.3 ADVANTAGES AND DISADVANTAGES OF THE SAMPLE SURVEY

2.7.3.1 Advantages of the sample survey

A major advantage of the sample survey is that it is representative and provides an objective and quantitative estimate of overall attitudes and of attitudes of distinct population subgroups. It may be especially important to have information on the knowledge level and attitudes of the silent majority in the case of a controversial project. Survey results can be generalized to a larger population within known limits of error; whereas, with methods such as participant observation, the limits of generality are unknown. The survey involves minimum interference in residents' lives and should meet the criterion of representativeness if it is properly conducted. None of the other methods outlined can claim to provide a statistically representative sample of explicit beliefs and attitudes.

A second advantage of the sample survey is that it produces a wealth of information in manageable form. The data can be manipulated statistically to show relationships among the variables in the study and to predict with greater precision, compared with other methods, the likely response of different groups to the repository.

2.7.3.2 Disadvantages of the sample survey

There are several disadvantages to the sample survey when it is used for attitude assessment. First, there is the problem of validity and of response set. The questionnaire format includes questions deemed important by the investigator and that may not reflect the frames of reference of respondents. Questions may not be understood fully by the interviewee or may not capture adequately the nuances of public perceptions, particularly those that are not usually verbalized by the subject. This can be a major problem for a complex and controversial issue. Either extensive pretesting or other preliminary measures must be taken to reduce this possibility, as is presented in the following discussions on focus groups. In addition, the publicity surrounding the findings of a survey may contribute to the possibility of survey findings in themselves creating opinions. Response set refers to the tendency of respondents to give responses that are systematically biased. These tendencies include: (1) social desirability or respondents' bias toward giving answers that portray themselves as "well-adjusted, unprejudiced, rational, open-minded, and democratic" (Cook and Selltiz, 1964); (2) acquiescience, or the tendency to accept all statements or reject all statements (Couch and Keniston, 1960); and (3) extremity, or tendency to avoid or to check the extremes of answer categories.

Second, an attitude survey that has been conducted at one time may not be a reliable indication of public opinions at a later time. To compensate for this, panel surveys as described in Section 2.7.2.1 may be established. However, panel analysis involves the problems of maturation, which are effects that occur because of the passage of time; reactive effects, which are attitude changes caused by the process of measurement; and bias in recruitment and retention. The latter problem may be difficult to overcome in the context of the NNWSI Project. It may be impossible to interview the same sample of persons repeatedly because of the lengthy time period involved and because of a high rate of population turnover in the area. Therefore, trend surveys, that select different samples from the same population, may be a more viable alternative. Both trend and panel surveys involve greater management requirements and would be more expensive than a cross-sectional survey.

Third, additional problems are posed by the complexity and cost of a potentially sophisticated survey design and the need for approval of the survey by the Office of Management and Budget (OMB), a process that reduces flexibility. And finally, as noted in Section 2.4.3.1, random samples may not be superior to key-informant interviews as predictors of events because they may not give the best representation of the distribution of power and interest.

2.8 METHODS INVOLVING GROUP PARTICIPATION

Several group methods have been used in social science research. The primary group methods that are discussed in this section include delphi, nominal, focus, and working groups. Two of these groups, delphi and nominal groups, are distinctive and have their own supporting literatures and histories of application oriented to interorganizational decision making or to solicitation of expert or citizen views as input for public policy formulation.

Dephi groups have also been used in technological forecasting. However, some of the more general comments related to the nature and purpose of qualitative research, as discussed in the following section, also apply to nominal and delphi groups as used in attitudes research.

2.8.1 FOCUS GROUPS

A focus group is composed of about a dozen members who engage in an open discussion concerning an issue to reveal attitudes toward the issue. A group moderator ensures that aspects of the issue of particular significance to the research are introduced into the discussion and plays a critical role in controlling the discussion and in preventing the occurrence of some of the potential disadvantages of group interaction (Merton et al., 1956).

Two distinct approaches to focus group discussions that have been identified by Calder (1977) have been discussed under the general label of qualitative research; however, their purposes are different. These differences have implications for the type of data produced, the organization of the group, and the role of members in the group, and are discussed separately in this section. The two approaches to the study of the content of attitudes, that were identified by Calder, are an exploratory approach undertaken prior to survey questionnaire design and a phenomenological approach that seeks to understand the everyday knowledge and experience of the group members. An additional approach, which was not discussed by Calder, involves the study of attitude dynamics and is discussed in this section.

2.8.1.1 The exploratory approach

2.8.1.1.1 Goal of the exploratory approach

This type of focus group can be used to make a preliminary assessment of attitudes and perceptions. It has been used prior to a survey to aid researchers in developing ideas to be verified later in research, or to pilot test and obtain feedback on questionnaire items. Data obtained from exploratory research may be regarded as only a starting point.

2.8.1.1.2 Organization of the group and role of the moderator

The moderator in exploratory groups is interested not so much in group dynamics as in stimulation of the researcher's thoughts. Therefore, interaction may be more one-on-one between the moderator and group members. Groups composed of members from heterogeneous backgrounds may be particularly valuable in producing a diversity of ideas and viewpoints.

V. Kerry Smith has used focus groups for exploratory research in a project designed to examine attitudes and perceptions toward hazardous waste that was conducted recently for the U.S. Environmental Protection Agency. The groups gave input both in ideas and in pretesting of questionnaire items before a survey was conducted of Boston residents' attitudes (personal communication with V. Kerry Smith, 1984.)

2.8.1.2 The phenomenological approach

2.8.1.2.1 Goal of the phenomenological approach

This approach stems from a philosophical perspective in sociology that emphasizes the representation of knowledge as the shared conscious experience of human beings (see also the view of risk as a social process, as discussd in Section 1.2). The goal of focus group discussions is the provision of a way of understanding how participants interpret reality in their own terms by allowing the researcher to participate in their experience.

2.8.1.2.2 Organization of the group and role of the moderator

Phenomenological focus groups have been used in several ways in social science research. They were used to examine the concerns of interest groups active in the restart issue regarding the perceived threat of the Three Mile Island plant (Soderstrom et al., undated). More recently, in the uranium enrichment studies, focus groups were designed to permit comparison of the attitudes and responses of groups judged most likely to be affected by plant closure (DOE, 1985a, b, and c).

Phenomenological groups should be composed of members from homogeneous backgrounds in view of the researcher's goal of experiencing the shared perspective of participants. The role of the moderator is to participate actively in the group interaction.

2.8.1.3 The study of attitude dynamics

2.8.1.3.1 Goal of the approach

The goal of the approach is to understand the processes of attitude formation and of dispute resolution strategies.

2.8.1.3.2 Organization of the group and role of the moderator

The groups may be composed of participants from similar or from a cross-section of backgrounds, depending on the investigator's research needs. The role of the moderator is to confront the group with "real life" scenarios designed to elicit different responses. Differences in response (substance and intensity) can be explored to permit insight into the reasons for the differences and preferred types of solution, or to analyze coalition building and dispute resolution strategies that may occur.

This type of focus group has been used recently in the Nuclear Power Options Viability Study undertaken by researchers at the Oak Ridge National Laboratory (Final report is in press; personal communication from Steve Rayner, 1986).

2.8.1.4 Advantages and disadvantages of focus groups

2.8.1.4.1 Advantages of focus groups

Group interaction can be a method to widen the range of response, to activate forgotten details, or to release inhibitions. Attitudes that could otherwise only be described by the respondent may be revealed during the process of interaction. For example, information on consensus formation and dispute resolution strategies would not be revealed in surveys or in informant interviewing.

Exploratory groups, designed to obtain a diversity of ideas and viewpoints, provide valuable input during the critical stage of pretesting questionnaire items. By this means, questions may be developed to reflect the frames of reference and wording of respondents.

Phenomenological groups hold considerable promise as a way by which the unique world view of particular groups within a population can be understood. The general population may be divided to suit the researcher's purpose: recruitment according to social groupings identified during the key-informant interviews, for example, would provide an opportunity to develop insight into group perceptions, attitudes, and values. Data obtained in this way clearly are not statistically representative of the underlying population. Their primary value lies in enhancing the researcher's understanding of local and regional viewpoints.

2.8.1.4.2 Disadvantages of focus groups

As noted, focus groups cannot claim to be statistically representative. In addition, group processes may affect the validity of the findings. Potential problems include the inhibiting effect of revealing attitudes in a quasi-public situation and the leader effect, in which group members may be dominated by persons who are more articulate or of higher socioeconomic status. Groups also present a greater degree of intrusion into residents' lives than surveys. It is possible that greater controversy may accompany the intrusion, particularly if group discussions are conducted on a large scale.

2.8.2 NOMINAL GROUPS

Nominal groups are structured according to a particular format as discussed in Section 2.8.2.2. They are used either for problem solving or for idea generation. Developed in 1968 by Delbecq and Van de Ven, they have been widely applied, particularly in human service organizations (Delbecq, Van de Ven, and Gustafson, 1975). Nominal groups also have been used in solar energy planning (Stephenson et al., 1982) and in decision making concerning power plant siting (Voelker, 1976).

2.8.2.1 Goal of nominal groups

The goal of the method is to structure group decision making to minimize the interference of informal group processes in effective decision making. Although the method has been used primarily in decision making and policy formation, its use in consumer research as a method of gauging perceptions and developing problem themes has been tried recently (Claxton, Ritchie, and Zaichkowsy, 1980). The latter way may be regarded more appropriately as a particular type of focus group. It is structured rather than open in form, but its goal is essentially similar to that of pheomenological focus groups that seek to gauge the everyday understanding of particular groups of people.

2.8.2.2 Description of nominal groups

Participants meet together in groups that are structured according to a recommended format. Members are first required to generate ideas privately in writing. Then, the ideas are recorded on a flip chart and are discussed for clarification and evaluation. Individual voting takes place and involves each member rating ideas. The group's decision is reached by mathematically pooling individual votes (Delbecq, Van de Ven, and Gustafson, 1975).

2.8.2.3 Advantages and disadvantages of nominal groups

Proponents of group processes claim that the groups score highly in terms of structuring the decision making and in high respondent involvement and commitment. Utility of the method in attitude/perception research is as yet relatively unproven; however, when it is used as a particular type of focus group, it is subject to similar strengths and weaknesses.

2.8.3 DELPHI GROUPS

Delphi is a judgmental method that is useful for situations in which individual judgments may be pooled. Delphi groups are similar to nominal groups in that they involve subjective judgments and that the solicitation of participant opinions follows a recommended format; however, the format differs. Groups are composed of experts whose opinions are sought and consulted. Typically, the experts do not meet in person but share their opinions in writing.

2.8.3.1 Goal of the delphi method

The delphi method was created in 1950 by Dalkey and associates at the Rand Corporation. It has been used in a variety of ways including technological forecasting, interorganizational decision making, and policy formation (Dalkey et al., 1972; Linstone and Turoff, 1975). Rauch has distinguished between three basic types of delphi, each of which has a different goal: (1) the classical delphi operates according to a mechanism of conditional scientific prognosis, its goal being to obtain consensus on data and facts; (2) the policy delphi deals with ideas. It does not aim to produce consensus, rather its goal is the clarification and definition of viewpoints;

and (3) the decision delphi, as the name implies, is a mechanism for arriving at a decision (Rauch, 1979). The policy delphi would be the most appropriate type to study attitudes, with exploration of dissent rather than achievement of consensus its main goal.

2.8.3.2 Description of the delphi method

Delphi is implemented as follows: (1) a questionnaire is submitted, either in writing or in person, to a group of carefully selected experts; (2) the group's opinions are pooled and averaged by the study team; (3) feedback on the group's opinions is given to the original respondents who are then asked to reevaluate, defend, or if necessary, amend their original answers based upon this feedback; (4) the resulting information is pooled, averaged, and again returned to the participants; (5) iteration is continued until participants no longer continue to make substantial changes in their opinions or until consensus is reached; and (6) a summary report is prepared (Linstone and Turoff, 1975).

2.8.3.3 Advantages and disadvantages of the delphi method

2.8.3.3.1 Advantages of the delphi method

Judged against the criteria listed in Section 2.2, the method scores very highly on practical feasibility, and on low cost. Exploration of dissent could provide valuable insights into attitudes (Coates, 1975). The major advantage of delphi may be the involvement of community leaders; indeed, as Hogarth has emphasized, the latter advantage may override criticisms that have been made of the effectiveness of the technique (Hogarth, 1977). For example, Maier (1967) believes that when delphi groups are used in decision making, a decision maker should be prepared to trade-off the quality of a decision against acceptance by those who will be affected by the decision. Similarly, Pill recommends that research in delphi should stress its psychological aspects in terms of communication, and Coates emphasizes that it should be evaluated for its usefulness rather than for its high reliability (Pill, 1971; Coates, 1975).

2.8.3.3.2 Disadvantages of the delphi method

Problems arise from the criteria of representativeness and validity. The reliability of the process has been subject to criticism primarily because the absence of recognized administrative standards provides too many opportunities for the intervention of the researcher's judgment. Validity has been challenged by those who criticize the selection of experts who may be very knowledgeable about current issues yet may lack insight into the opinions and attitudes of others. The experts used in delphi may not be representative of the community or its subgroups. Moreover, expert judgments have been shown to be fallible and subject to a variety of biases including the influence of the bandwagon effect and fatigue (Pill, 1971; Hill and Fowles, 1975; Sackman, 1975; see also Mumpower and Anderson, 1983, for a

review of the literature on the quality of human judgment and some recommendations for improving judgments).

2.8.4 WORKING GROUPS

There is a wide variety of groups that may be termed working groups that meet to discuss, to explore, to trade-off values, or to negotiate settlement, and to take action on issues arising from project development. Development of mitigation strategies is a prime example of the type of work that is undertaken.

2.8.4.1 Goal of working groups

Working groups may be distinguished from the groups discussed previously in that their purpose is essentially oriented toward action rather than toward the exploration of attitudes. They are therefore discussed only briefly in the following section.

2.8.4.2 Description of working groups

Considerable experience has been gained in organizing these groups in the state of Wyoming, which has used the method as part of its regular governmental process. Groups are composed of citizen participants, who are usually selected by an open process, and who typically elect a chairman. Expert opinion is provided by a government staff person and by any consultants who are involved in a project (from personal conversations with Carl Ellis, Wyoming Industrial Siting Administration and Jim Thompson, Western Research Corp., 1984). The particular way in which groups are organized, however, need not be fixed.

Soderstrom (1981), has reported on the use of workshops that combine public involvement and data gathering. The Laboratory of Architecture and Planning at MIT used workshops that brought together representatives of various citizen groups to discuss and share information regarding issues and impacts viewed as critical to the community.

Group meetings have also been used by the Bureau of Reclamation in their Public Values Assessment process. Groups are organized according to relevant publics or stakeholders involved in a particular decision (see Willeke, 1977; Creighton, 1980; and Anderson, 1981, for methods of identifying publics). The goal of the meetings is to assess values that are relevant to a decision and to combine them with technical data to arrive at a rating of alternative plans (U.S. Department of the Interior, 1981).

2.8.4.3 Advantages and disadvantages of working groups

Although they do not have a direct role in the study of attitudes, establishing groups such as these may have value in facilitating communication and cooperation between the U.S. Department of Energy and State and local entities. Working groups take into account the dynamic nature of attitudes

and the fact that human beings (unlike physical phenomena) talk back and act purposively. A potential problem is the establishment of groups outside of elected government officials who may not approve of decisions that are reached, or who may be concerned that their authority is being usurped.

CHAPTER 3

CONCLUSIONS

The complexity and fluidity of human affairs makes measurement and prediction in the social sciences inherently uncertain. A variety of methods may be used to assess attitudes; however, no one method used alone can capture their entire complexity. Because each method reveals different aspects of empirical reality, multiple methods of observation should be employed. This approach is termed triangulation (Denzin, 1978)[7]. Triangulation represents a more complete approach to understanding public attitudes: it measures public opinion from a variety of angles, allows the researcher to balance the strengths and weaknesses of different methods and gain understanding of an issue, and reduces the uncertainty of findings. Therefore, the ideal strategy for the Nevada Nuclear Waste Storage Investigations (NNWSI) Project would be to use several assessment methods integrated into one overall strategy.

Chapter 3 outlines a conceptual approach to integrating several of the methods identified in the previous chapter. The strategy is not intended to generate results rapidly; rather, it calls for a step-by-step approach to the problem of understanding how people interpret their world, by the pyramiding of evidence into a relatively conclusive whole (Finsterbusch and Hamilton, 1978). The approach presented in this chapter is for purposes of illustration only. In practice, the methods used to assess attitudes would be integrated within the overall social impact assessment process, which is presented in greater detail in the companion report, Social Impact Assessment: A Review and Proposed Approach (SAIC, 1986).

The chapter is divided into three sections: Section 3.1 discusses the principles that have guided the approach presented in this paper; Section 3.2 outlines an overall design; and Section 3.3 provides a brief conclusion.

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[7] Denzin has identified four basic types of triangulation: (1) data triangulation, the use of a variety of data sources in a study; (2) investigator triangulation, the use of several different researchers or evaluators; (3) theory triangulation, the use of multiple perspectives to interpret a single set of data; and (4) methodological triangulation, the use of multiple methods to study a single problem or program (Denzin, 1978). The correlation of quantitative and qualitative approaches was demonstrated in the recently completed U.S. Department of Energy uranium enrichment studies. In the latter, qualitative information from focus group discussions and key-informant interviews was used to indicate where differences may arise between ideal behavior, as predicted by socioeconomic models, and actual behavior (DOE 1985a, b, and c).

3.1 UNDERLYING PRINCIPLES

Three principles have guided the approach presented in this paper. First, as noted in Chapter 1, the subjective nature of risk perception necessitates an understanding of the way in which different population groups within the study area view their world and a knowledge of their concerns about the NNWSI Project. Second, research should be policy relevant: developing an awareness of citizen attitudes and perceptions should be linked to identifying possible responses and ways of consensus building. Third, it is essential to involve local expertise and residents in the process.

3.2 OVERALL DESIGN

To meet the objective of understanding and measuring attitudes from a variety of angles, a series of actions is recommended. The overall strategy, as outlined in Sections 3.2.1 through 3.2.4, represents a step-by-step approach whereby each method builds on data obtained previously. In this way, an integrated and comprehensive knowledge base would be developed. It should be noted that in view of the relatively long time period involved before the start of repository construction and operation, it may be necessary to undertake several iterations of one or more of the methods.

3.2.1 STEP ONE: COLLECT BACKGROUND DATA AND INITIATE CONTENT ANALYSIS OF LOCAL AND REGIONAL NEWSPAPERS

Secondary data collection has already begun as part of the socioeconomic studies for the NNWSI Project. The goal is to develop a thorough background understanding of the overall impact area and of individual communities within it. This understanding represents an essential first step in the study of attitudes toward the repository. In addition, content analysis of local and regional newspapers can be used to obtain information on community social life and to identify reported concerns and stakeholder groups.

3.2.2 STEP TWO: INTERVIEW KEY INFORMANTS

Secondary data sources provide valuable background material on the historical, social, and economic composition of a community. Key-informant interviews, identified in Section 2.4, can go beyond the secondary data sources to provide a more complete understanding of community structure: emphasis would be placed on the identification of social groupings, their patterns of interaction and attitudes and values. The method provides a valuable opportunity for systematic community interaction and for the involvement of area personnel.

3.2.3 STEP THREE: ASSESS ATTITUDES TOWARD REPOSITORY ACTIVITIES

Awareness of community social groupings, their general attitudes and world views, as revealed in the key-informant interviews, should provide the background against which specific attitudes toward the repository can be examined. Therefore, step three builds upon the knowledge gained using

either: (1) a sample survey, (2) focus groups and interviews conducted on an iterative basis, or (3) a combination of both of the preceding methods. In all cases, the primary data can be supplemented by a continuation of the content analysis of local newspapers to permit identification and monitoring of the concerns raised and of the activities of key stakeholder groups area-wide (see Willeke, 1977, for a detailed description of methods to identify publics).

Seven specific aspects to be explored include: (1) level of knowledge of nuclear waste; (2) previous experience and familiarity with nuclear facilities; (3) positive and negative attributes of the NNWSI Project from the area viewpoint; (4) the direction and strength of attitudes; (5) the connection between attitudes and behavior; (6) the relationship between attitudes and beliefs about the repository and other attitudes, beliefs, and values; (7) key concerns about the proposed repository location; and (8) possible DOE responses that could mitigate community concerns. An essential part of the study would be to determine where differences between population subgroups exist.

The overall strategy design at this stage can be planned around three possible approaches. One approach calls for implementation of a sample survey using key-informant interviews for hypothesis development and continuous cross-validation, and exploratory focus groups to pretest questionnaire items. A second approach would substitute for the survey a combination of interviews and phenomenological focus groups, implemented on an iterative basis. A third approach would rely primarily on interviews and focus groups, as in the second approach, with the addition of a minisurvey to provide a check on the representativeness of results.

3.2.3.1 Selection of a sample survey

As noted in Chapter 2, the primary advantages of the sample survey are that it provides a statistically representative and potentially objective measure of public opinion and a valuable information base for predicting social impacts. In addition, its statistical representativeness could protect the NNWSI Project from possible charges of unfair selection and manipulation of citizens' attitudes. These advantages are considerable; however, they must be balanced against problems that could arise over complexity, cost, lack of flexibility, and possible delays obtaining clearance from the Office of Management and Budget (OMB). Also, in using a sample survey, there is a risk of negative publicity and a possibility that survey findings could affect opinions.

If a decision were made to conduct a survey, it is recommended that either the panel or trend survey be used. These types of survey would allow for monitoring, over time, of attitudes both of the study area population and of population groups within it. As discussed in Section 2.7.3.2, a trend survey may be a more viable alternative in the context of the NNWSI Project.

Questions of survey cost and information needs, especially the need to determine differences between population groups, would guide the resolution of technical issues such as the selection of a particular sampling method and

the required sample size. These would require discussion with the organization selected to undertake the survey. Cost would also be a major factor in deciding whether to use mail-out, personal, or telephone interviews.

Designing questions to be included on a questionnaire is a complex and time-consuming process. As noted in Section 2.7.2.4, it is difficult to capture all of the nuances of public attitudes in simple, structured questions. Therefore, it is recommended that pilot testing of open questions be undertaken with the objective of using the responses to construct closed alternative questions that reflect the frames of reference and wording of respondents. If this process were employed, questionnaires could be composed primarily of closed questions that are less difficult to code, with the addition of a limited number of open questions that ask the reasons for a response.

The use of exploratory focus groups such as those used by V. Kerry Smith in his recent survey of Boston citizens' attitudes toward hazardous waste disposal may be of particular value in designing questions for a complex and controversial subject. Exploring a diversity of attitudes and pretesting certain questions on a limited number of focus groups is strongly recommended. Although the additional step will add to the time involved in conducting a survey, it will increase the probability of obtaining an accurate reading of public attitudes.

3.2.3.2 Assessing citizens' attitudes without a sample survey

An alternative approach that would substitute for the sample survey is an expansion of key-informant interviews and focus group discussions. This approach explores residents' attitudes with a view to developing an awareness of similarities and differences between and within communities and to obtain a representative cross section of views.

Although use of these methods would afford considerable insight into citizens' attitudes, two shortcomings must be emphasized. First, the methods cannot claim to be statistically representative; second, the NNWSI Project could be perceived as biasing the findings in its favor by unrepresentative selection or manipulation of participants.

3.2.3.2.1 Key-informant interviews

The first phase of key-informant interviews, outlined in step two above, will have made possible a preliminary identification of social groupings and of their underlying values and attitudes toward community attributes, problems, and growth. Therefore, this second phase of key-informant interviewing seeks to understand more specifically how the proposed repository is viewed, including specific concerns, possible policy options for responding to the concerns and the likely connection of attitudes to behavior.

In small area communities, which may experience both standard and special impacts, emphasis would be placed on continued exploration of differences in attitudes and values among social groupings. For the area overall (including urban Las Vegas), emphasis would be placed on contacting and monitoring the

attitudes of active stakeholder groups. Use of the delphi method (Section 2.8.3) may be a valuable addition to the interviews because the method would permit interaction among viewpoints. However, it is possible that use of the delphi method may be viewed as too timeconsuming by some area communities; in this event, a simple form of iterative interviewing should suffice.

3.2.3.2.2 Focus groups

Focus group discussions would provide an opportunity to explore, in greater detail, the viewpoint of different segments of the population. The first iteration of discussion groups could be of the phenomenological type, as discussed in Section 2.8.1.2, followed by a change to an analysis of attitude dynamics and involvement in discussion of possible solutions, as discussed in Section 2.8.1.3.

The focus groups would be homogeneous in composition. In small area communities, participants would be recruited to correspond with the social groupings identified by key informants. In the overall area (including Las Vegas) participants would be recruited from the stakeholder groups active in each local area.

The use of focus groups requires the selection of experienced personnel to conduct the groups. Recruitment of group members, which is a critical component of the method, would be most appropriately undertaken by persons with knowledge of the area communities.

3.2.3.3 The addition of a minisurvey

A third approach would combine the interviews and focus groups, as discussed in the preceding section, with a minisurvey that would provide a check on the representativeness of the results. A limited number of items that previous research indicated as being particularly important could be included on a more general survey that had already been designed for distribution in the area. The complexity and cost of a survey could be avoided, yet the data gathered from the combination of activities would be statistically representative. However, a minisurvey would offer only limited potential for complex analytical techniques, with accompanying constraint on the degree of accuracy in predicting impacts.

3.2.4 STEP FOUR: FORM CITIZEN POLICY GROUPS

The final step in the overall design strategy recommends the establishment of working groups that would be either structured informally as in Wyoming or more formally as in the nominal group technique or the public values assessment process of the Bureau of Reclamation. The working groups would be a valuable addition to the strictly research-oriented approach of studying citizens' attitudes alone. The desire to participate in the action-oriented policy development of the working groups may follow naturally from focus group participation. Ideally, working groups would include community leaders, residents, and involved experts which may include consultants from Science Applications International Corporation or government officials

involved in impact analysis and mitigation development. The overall goal of the working groups would be to provide a forum for open discussion of issues to be resolved in repository construction and operation.

3.3 CONCLUSION

The strategy outlined in the preceding section has been presented to illustrate, in practical terms, the concepts of triangulation and pyramiding of evidence. These concepts, which are discussed in greater detail in the companion report, "Social Impact Assessment: A Review and Proposed Approach" (SAIC, in press) involve: the use of a variety of methods that would increase the likelihood of obtaining an accurate reading of public opinion; and, the adoption of a step-by-step approach in which each method builds on data obtained previously. This overall strategy would permit the development of a carefully integrated and comprehensive knowledge base. Plans for successive steps in the overall design could be amended on a continuous basis, as circumstances change, as new evidence is obtained, and as new insights are developed.

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