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Nevada Nuclear Waste Storage Investigations Project

SOCIAL IMPACT ASSESSMENT: A REVIEW AND PROPOSED APPROACH

FINAL REPORT

DECEMBER 1986

WORK PERFORMED UNDER CONTRACT NO. DE-AC08-83NV10270

Technical & Management Support Services

Science Applications International Corporation

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SOCIAL IMPACT ASSESSMENT: A REVIEW AND PROPOSED APPROACH

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December 1986

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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 DOE Office of Civilian Radioactive Waste Management.

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TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

OBJECTIVE OF THE REPORT

The objective of the report is to identify the essential components of a comprehensive plan to assess the potential social impacts of the proposed construction and operation of a high level radioactive waste repository by the Nevada Nuclear Waste Storage Investigations (NNWSI) Project.

The tasks taken to achieve this objective are:

- Examination of the literature on Social Impact Assessment (SIA).
- Identification of different conceptual frameworks that have been proposed or used in SIA.
- Examination of specific aspects of the frameworks.
- Assessment of strengths and weaknesses of the frameworks.
- Synthesis of common elements in these frameworks.
- Examination and evaluation of methods of data collection and analysis.

DEFINITION OF SOCIAL IMPACT ASSESSMENT (SIA)

SIA is concerned with the human implications of policy decisions. As discussed in this report, it is anticipatory research that attempts to understand and forecast the consequences of a proposed policy or project on the behavior and interactions of social groups and the underlying values, attitudes, and perceptions that shape those interactions. Its basic purpose is to determine the effect on quality of life or well-being.

SOME DIFFICULTIES ENCOUNTERED IN CONDUCTING SOCIAL IMPACT ASSESSMENT

- SIA cannot be undertaken adequately without taking into account the meaning of changes to potentially affected persons.
- SIA is an interactive process.
- Many social variables represent abstractions that cannot directly be measured.
- Expressed attitudes and intentions are not necessarily reflected in subsequent behavior.
- Causes of change are difficult to isolate because of the existence of many interrelated factors.
- The privacy and confidentiality of participants must be respected in the collection and transference of primary data.

FINDINGS OF THE REPORT

The review of SIA frameworks in Chapter 2 and the review of methods in Chapter 3 indicates that:

- SIAs have been conducted using a variety of frameworks.

  There is not one best way to assess social impacts. Social life is multifaceted; researchers have used a variety of methods and have placed varying emphasis on the measurement of the different facets.

- Variation can be discerned, among the frameworks reviewed, in three major areas:

  (1) Emphasis on aspects of social life. People experience well-being as individuals in formal and informal groups, in communities, and within the broader society. These aspects represent different units of analysis and require different measuring techniques.

  (2) Theoretical and philosophical orientation.

  (3) Selection of methods.

- Particular strengths and weaknesses are apparent in each framework.

- Four basic components for analysis can be identified:

  (1) Community well-being.

  (2) Individual and group well-being.

  (3) Values.

  (4) Perceptions and attitudes toward a proposed policy or project.

- A variety of methods may be used in SIA. Two broad groups of methods are quantitative and qualitative methods.

  (1) Quantitative methods include secondary data collection and analysis, content analysis (this method may also be used qualitatively), and sample surveys. Quantitative methods such as the random sample survey typically have been used to aggregate responses and be statistically representative of the population.

  (2) Qualitative methods include participant observation, key-informant interviews, and group methods such as focus group discussions. Qualitative methods disaggregate responses, permit the researcher to observe attitudes and behaviors in a natural setting, and promote depth of understanding. However, it is difficult to estimate precisely the statistical representativeness of the findings.

RECOMMENDATIONS

- An integrated approach.

  In varying degrees, each of the frameworks examined is based on a different underlying theoretical and philosophical perspective, emphasizes one type of method, and focuses on a different unit of analysis. As discussed in Section 3.3, attempts to understand and predict social effects from one viewpoint only are unlikely to capture the complexity and diversity of social life. Therefore, the approach suggested for use by the NNWSI Project draws on the strengths of each to design a comprehensive plan to assess the social impacts of the proposed repository construction and operation.

- Scope of the study.

  Recommendations for a scope of work appropriate for the NNWSI Project are made in Section 2.12. These are summarized in Table 2-2, which proposes the measurement and analysis of five basic components:

  (1) Community well-being.

  (2) Individual and group well-being.

  (3) Values.

  (4) Perceptions and attitudes toward the proposed repository construction and operation.

  (5) Institutional well-being.

- Method Selection.

  As discussed in Section 3.3, no single method can capture the entire complexity of social life. Therefore, this report recommends the use of multiple methods, referred to as triangulation.

- Integration of Methods.

  The recommended approach is an interactive one in which both qualitative and quantitative methods are used throughout the study. A basic feature is that the steps of data collection and analysis are viewed as iterative. Figure 3-2 illustrates the recommended approach.

CHAPTER 1

SOCIAL IMPACT ASSESSMENT

1.1 INTRODUCTION

The primary purpose of this paper is to identify the essential components of a comprehensive plan to assess the social impacts of the proposed construction and operation of a high level radioactive waste repository by the Nevada Nuclear Waste Storage Investigations (NNWSI) Project. Chapter 1 provides background information on Social Impact Assessment (SIA): a discussion of the social phenomena that can be affected, a brief outline of some of the difficulties of conducting an SIA, an overview of the development of SIA, and a discussion of SIA in the context of the NNWSI Project. The identification and review of frameworks in Chapter 2 is undertaken with the purpose of recommending an approach appropriate for assessing the potential impacts of the proposed repository construction and operation; theoretical orientation and units of analysis addressed by different frameworks are examined, common elements are synthesized, and particular strengths are incorporated. The discussion of methods of data collection and analysis in Chapter 3 recommends an approach based both on an assessment of strengths and weaknesses of quantitative and qualitative methods and on an evaluation of the concept of triangulation. Appendix A discusses some examples of the practice of SIA by Federal agencies, as evidenced in selected draft and final Environmental Impact Statements.

SIA is concerned with the human implications of policy decisions. It is anticipatory research that attempts to forecast the consequences of a particular policy on social phenomena. Evolution and variation in approach, which are notable features, can be discerned both in the definition of social phenomena likely to be affected and in the overall development of SIA.

Chadwick, Bahr, and Albrecht (1984) outline five distinct tasks of SIA which apply to all approaches: (1) completion of a baseline social profile, or comprehensive description of study area social characteristics; (2) development of a baseline projection of the expected degree and direction of change in each of the social characteristics without the proposed project; (3) description of the proposed action (e.g., number and timing of expected inmigrants); (4) social impact projections, or detailed discussion of how the project may change the area; and (5) social impact analysis, or comparison of with- and without-project projections to assess net changes or impacts (see also the extended "main pattern" task delineation by Wolf, 1983). In all of these tasks, SIA is closely linked to potential economic, demographic, community services, and fiscal impacts associated with the proposed project.

Performance of the five tasks requires answers to three basic questions. First, what are the social phenomena that can be affected? Second, what theoretical framework, or set of hypotheses by which social phenomena change, can be used to guide the analysis? And third, what methods of data collection and analysis are appropriate? More specifically, to answer the third question, what set of methods can be used for "organizing data about the community and the project in terms of the model to permit predictions

about the future consequences of different alternatives" (Bowles, 1981). This paper examines a variety of proposed solutions to these questions.

1.2 SOCIAL PHENOMENA THAT CAN BE AFFECTED BY PROJECT DEVELOPMENT

The following series of quotations from SIA practitioners serve to illustrate the social phenomena that can be affected by project development.

> The purpose of social impact studies is to answer the following question: Will there be a measurable difference in the quality of life in the community as a result of what the proposed project is doing or might do in the future (Burdge, 1983)?
>
> SIA is, in short, assessing the effects of projects or policies on people--the human implications of what we do. It attempts to forecast the effect that a proposed development will have on the quality of life--the traditions, lifestyles, interpersonal relations, institutions, and living environment (D'Amore and Rittenberg, 1978).
>
> In principle, large scale planned change ... can have an effect on the entire fabric of a community ... The entire matrix of community beliefs, attitudes, values, norms, and practices may be affected ... Change has a way of creating other changes, much as the proverbial rock thrown in a pond (Burdge and Johnson, 1977).
>
> Social impacts include changes in community organization, community perceptions, lifestyles and satisfaction, and the effects of a proposed development on such specific groups as the elderly, minorities, and people living on fixed incomes (Thomas, Albrecht, and Murdock, 1983).

Murdock and Leistritz (1979) concluded from their review of studies of the the impacts of energy development in the western United States that the two major categories of social phenomena to be addressed are (1) social organization, social structures, and social processes and (2) the underlying values, attitudes, and perceptions that shape these processes.

As discussed in this report, SIA assesses the impacts of a proposed project on social groups and must take into account both the behavior and interactions of groups and on the underlying values, attitudes, and perceptions that shape those interactions. A more accurate definition is sociocultural impact assessment, where sociocultural is defined by Keesing as "the patterns-of-life . . . the social realization or enactment of ideational designs for living in particular environments." Ideational designs include "patterns of shared meanings and systems of knowledge" (Keesing, 1974).

1.3 SOME DIFFICULTIES ENCOUNTERED IN CONDUCTING SIA

Conducting SIA is complex. Some of the primary difficulties that may be expected to arise are as follows:

1. Impact assessment cannot be conducted at the objective level only. The objective situation affects people through their perception of the situation; therefore, an assessment must also include the meaning of the change to the people concerned.

2. SIA is an interactive process. The process of measurement changes the environment--the investigator must interact with people who are simultaneously objects of measurement and purposive actors.

3. Many social variables (e.g., diversity, cohesion, interaction) represent abstractions that cannot be directly measured. Such abstractions must be inferred from statements and observation or records of current and past actions and events.

4. Expressed attitudes and intentions are not necessarily reflected in subsequent behavior. The relationship between attitudinal factors and likely behavioral response is complex: attitudes must be combined with other factors to predict behavior.

5. Causes of change are difficult to isolate because of the existence of many interrelated factors. Forecasting social phenomena is made additionally complex because social change is continuous rather than discrete. Thus, it is difficult to attribute any particular change to a given historical event.

6. The collection and transference of primary data must respect the privacy and confidentiality of the participants. Sociologists are guided in their professional work by the Code of Ethics of the American Sociological Association.

1.4 THE DEVELOPMENT OF SIA

Social scientists have examined the effects of technology on individuals and social systems prior to 1970 (see, for example, Cottrell's classic 1951 study of the effects of the introduction of the diesel engine on the Nevada community of Caliente). However, the development of SIA, as it is currently practiced, has resulted largely from legislative mandates.

A major factor in the development of SIA has been passage of the National Environmental Policy Act of 1969 (NEPA) and related Federal agency policy guidelines (Freudenburg and Keating, 1982). NEPA requires Federal agencies to prepare an Environment Impact Statement (EIS) for major actions that "significantly" affect the "quality of the human environment" (NEPA, Section 102.2C). "Integrated use" of the natural and social sciences is specified (NEPA, Section 102.2A), while the implementing regulations of the Council on

Environmental Quality call for "full and fair discussion" of significant impacts (CEQ, 1978). State and local government concerns have been embodied in environmental or other facility siting legislation similar to NEPA, and industry concerns have also been influential. Industry concerns have arisen from difficulties in attracting and retaining a stable work force; the desire to build community support and to avoid long, costly delays in project implementation; and the need to meet the requirements imposed by some states that industry accept financial responsibility for the adverse community impacts associated with their project (Chadwick, Bahr, and Albrecht, 1984).

Particularly noteworthy aspects of the development of SIA over the past 15 years have been a growing awareness of the need to pay attention to sociocultural variables; the gradual emergence of a more coherent, theoretically based approach to SIA; and the development of a body of empirical literature documenting the incidence and magnitude of social impacts that have occurred in a variety of contexts.

1.4.1 THE CONCEPT OF SOCIAL IMPACT

Several authors have suggested that the preparers of Environmental Impact Statements have neglected or incorrectly defined social factors that contribute to the quality of the human environment. These authors claim that NEPA's "unquantified amenities and values" tend to have been ignored in favor of NEPA's "economic and technical considerations" (NEPA, Section 102.2B). In addition, the critics claim that social factors frequently have been either restricted to consideration of public service impacts, viewed as a means of gaining public acceptance of unpopular policies, or reduced to a residual category of factors that are not included in economic, demographic, public service, and fiscal assessment sections of EISs (Friesema and Culhane, 1976; Wilke and Caine, 1977; Cortese, 1979a; Jorgensen, 1981; Leistritz and Murdock, 1981; Freudenburg and Keating, 1982; Murdock, Leistritz, and Hamm, 1985).

More recently, however, researchers have openly acknowledged that narrowly restricting social and economic effects to measurable changes in employment, demographics, housing, fiscal, and public service provisions gives inadequate recognition to the wide range of information required for effective decision-making. For example, the National Research Council, in their report, Social and Economic Aspects of Radioactive Waste Disposal, pointed to the need for an interpretation of the term socioeconomic that goes "beyond the relatively narrow definition usually employed in Environmental Impact Statements" (National Research Council, 1984; for related discussions, see also Daneke and Priscoli, 1979; Cramer, Dietz, and Johnston, 1980; Freudenburg and Keating, 1982; Branch et al., 1984; and Carley and Bustelo, 1984). Two authors have characterized the apparent neglect of social science expertise in EISs as "a legal anomaly [whose] days (or at least its years) are numbered" (Freudenburg and Keating, 1985).

However, considerable confusion has been apparent over the definition of the term social impact. Although Wolf has asserted that quality of life (alternatively termed social well-being) is the "basic focus" of SIA, varied interpretations of the components of quality of life are seen throughout the

literature (Wolf, 1983; see also Freudenburg and Keating, 1982; Burdge, 1983; Carley, 1983; Branch et al., 1984; Olsen et al., 1978, 1985; and Braund, Kruse, and Andrews, 1985). The variation in interpretation of the concept is reflected in practice. Different researchers have placed varying emphasis on measuring quality of life for different social groups (see Finsterbusch, 1977, for a discussion regarding the differentiation of impacts by social unit being impacted). Variation also exists in identification of the components of quality of life for different social units and in the emphasis on objective changes versus changes that are perceived by the affected persons.

1.4.2 THEORETICAL APPROACHES

Until very recently, SIA could have been aptly characterized as a collection of methods without a theory--a field of endeavor marked by the absence of a specifically acknowledged and comprehensive conceptual framework. Although Leistritz and Murdock (1981) have noted that several theoretical bases, adapted from the broader field of sociology, are implicit in the work of SIA investigators, a review of the early years of progress in the field, led Carniol, Gutnick, and Ryan (1981) to conclude:

> It seems to be inevitable that SIA is still very much within the stage of "becoming" ... SIA attempted to create a new methodology and it encountered problems typical of new disciplines. Flexibility regarding what to include, what to exclude, and how to rank various theoretical considerations led to confusion and inconsistencies. Though early SIA methodology derived primarily from the biological and social sciences, coherence was lacking, concepts, techniques, and procedures for SIA were lifted piecemeal out of that context and without the accompanying bodies of theory. Then, they were applied with little modification to situations for which they were not designed. The bits and pieces from ecology, sociology, biology, social psychology, and social welfare did not mesh into a comprehensive, interdisciplinary methodology. Rather, they became a conglomeration applied with predictably chaotic results.

Recently, some authors have noted a maturing of SIA (Finsterbusch, 1985; Freudenburg, 1986, in press). While it is true that increasing attention is being paid to the theoretical foundations (see, for example, Bowles, 1981; Tester and Mykes, 1981; Finsterbusch, 1982; Carley and Bustelo, 1984; Freudenburg and Keating, 1985; Jobes, 1985; Murdock et al., 1985; and Braund, Kruse, and Andrews, 1985), attempts to integrate approaches to SIA are not yet apparent in any publications.

1.4.3 EMPIRICAL LITERATURE

The body of empirical literature on social impacts includes the boomtown literature on the impacts of energy development in the western United States, postlicensing studies of nuclear projects at multiple sites, natural resource

development literature (especially work of Federal water resource agencies), highway construction literature, the Three Mile Island (TMI) studies, and Canadian SIA literature. Several recently published bibliographies and reviews of findings on social impacts have provided valuable guides to the literature (see especially Murdock and Leistritz, 1979, and Weber and Howell, 1982, for discussions and review of the literature on the impacts of energy development in rural areas of the western United States; Murdock, Leistritz, and Hamm, 1985, for an update on the status of socioeconomic analysis; the U.S. Department of the Interior, Bureau of Land Management, Social Effects Project Literature Review, Mountain West Inc., 1980, and Chalmers et al., 1982, for the summary report of the Nuclear Regulatory Commission (NRC) postlicensing studies of socioeconomic impacts of nuclear generating stations; Hitchcock and Strobel, 1977, for an overview of water resource studies; Finsterbusch, 1980, for a summary of the highway findings; Walker et al., 1982, for a summary of the TMI workshop on psychological stress; and Bowles, 1981, and Tester and Mykes, 1981, for discussion of some of the Canadian literature on social impacts).

Murdock, Leistritz, and Hamm (1985) have briefly reviewed and organized findings of the literature on the social impacts of energy development in the western United States, which dominates the SIA literature, around five questions most commonly addressed. The questions listed by Murdock, Leistritz, and Hamm are as follows:

1. Do large-scale projects alter the social interaction patterns and social structural composition of rural communities?

2. Do such projects lead to major disruptions in social control mechanisms in rural areas and thus, result in increased rates of crime, delinquency, marital dissolution, etc.?

3. Which groups are most positively impacted and which are most negatively impacted by such projects (e.g., the elderly, the poor, the young)?

4. What levels of social psychological stress are placed on persons living in the siting areas of large-scale projects, and if stress is induced, does it have temporary or permanent effects on area residents?

5. Overall, do rural residents perceive large-scale projects as having had positive or negative impacts on their communities, and which aspects do they believe have been most positively and negatively impacted?

Several authors have noted the changed focus of the western United States' energy development literature. Early studies of boomtowns appeared to indicate widespread alterations in the interaction patterns and social structure of rural communities, citing increased social pathologies and stress as evidence of generalized social disruption. However, more recent studies have not assumed social disruption and have concluded that the effects of projects cannot be said to be either uniformly negative or uniformly positive. Increasingly, the focus is on documenting impacts on

specific aspects of community life for specific groups (Murdock, Leistritz, and Hamm, 1985; England and Albrecht, 1984. See also Wilkinson et al., 1982, for a critique of the disruption hypothesis; commentaries by Albrecht, Finsterbusch, Gale, and Murdock and Leistritz are included in the same issue of the Pacific Sociological Review).

1.5 SIA IN THE CONTEXT OF THE NNWSI PROJECT

Three features serve to distinguish the NNWSI Project from the projects typically discussed in the western United States' energy development literature. These features, which may affect the scope of the assessment, are (1) the accessibility of the site from a large urban area (metropolitan Las Vegas), (2) the provisions of the Nuclear Waste Policy Act (NWPA), and (3) the radiological mission of the repository. This final section of the chapter discusses each of the features and concludes with a recommendation for their integration into a comprehensive plan to assess the social effects of repository construction and operation.

1.5.1 ACCESSIBILITY FROM METROPOLITAN LAS VEGAS

The five questions listed in the preceding section have been concerned with the social effects of project-induced employment, fiscal, population, organizational, or regulatory changes. These so called "standard" social changes are those that have occurred as the result of resource development or the construction of large-scale projects in rural areas, which typically have been accompanied by a large influx of population. In contrast, the potential area of settlement for workers at the proposed repository at Yucca Mountain includes metropolitan Las Vegas (approximately 100 miles to the South and East) in addition to several small rural communities. Over 80 percent of the workers at the Nevada Test Site (NTS), which bounds the proposed repository site on the East, commute from the metropolitan area each day. The distance to Mercury, the nearest point of the NTS to Las Vegas, is 65 miles; however, since the NTS covers an area of 1,350 square miles (DOE/NV, 1986), many workers may travel considerably further than 65 miles. Low-cost ($ 1.00 each way) bus transportation is available. If inmigrating workers similarly choose to commute in preference to settling in one of the rural communities closer to the site, the extent of social effects (particularly those resulting from project-induced increases in population) may be small.

1.5.2 THE PROVISIONS OF NWPA

A second feature of the NNWSI Project is that the provisions of the Nuclear Waste Policy Act (NWPA) may reduce the potential for negative social effects. Under the Act, extensive provision is made for affected States and Indian Tribes to participate in planning. Additional sections of the Act provide for financial and technical assistance, designed to mitigate the impacts of repository development. Implementation of these provisions may serve to reduce adverse social effects and enhance the possibility that potentially affected communities may gain some benefit from the proposed repository construction and operation.

1.5.3 THE RADIOLOGICAL MISSION OF THE REPOSITORY

The long-term radiological mission of the proposed repository, which represents a first-of-kind project, constitutes a third distinctive feature of the NNWSI Project.

Several authors have made a conceptual distinction between the potential for "standard" effects, which were discussed in Section 1.5.1, and the potential for "special" effects arising from the radiological mission of the proposed repository. In the words of Thomas, Hamm, and Murdock (1983); "In addition to the standard socioeconomic effects . . . repositories will have effects that are unique or specialized because they are 'nuclear' repositories and consequently, are subject to the effects of public perceptions and attitudes regarding nuclear power and nuclear waste."

A National Research Council Report (1984) suggested that such effects "will interact with and may well exceed the more conventional effects resulting from the location of any large industrial facilities in rural communities." Because such special effects may arise as much from high-level radioactive waste transportation as from the facility itself, and because the degree of controversy that could accompany the siting may result in impacts on the broader society, the geographic scope of the area of potential impact may extend beyond the immediate settlement area typically considered in standard social impact assessments. Thus, as highlighted by Albrecht (1983), many of the findings on standard social effects of the western energy development literature may be of "limited applicability" in the context of the proposed high-level radioactive waste repository.

A number of concerns have been anticipated in the literature on the special effects of repository siting. Some stem directly from the nuclear nature of the repository; others stem more indirectly, through questions about equity and lack of public confidence in decision-makers. Concerns are over risks to health and safety, perceptions of equity (including ethical questions regarding the intergenerational transfer of risks and benefits), and concerns regarding transportation activities, security, and civil liberties (see especially, Hebert et al., 1978; Cluett et al., 1980; Thomas, Albrecht, and Murdock, 1983; Albrecht, 1983; National Research Council, 1984. A recent collection of articles by prominent authors on public attitudes toward nuclear power and the factors that lie behind them is included in Freudenburg and Rosa (1984); additional bodies of research related to risk perception and research undertaken at the Battelle Human Affairs Research Center are listed in separate sections of this report's bibliography). An understanding of these concerns is important both in and of itself (see for example the recognition given to "public concern" over high-level radioactive waste and spent nuclear fuel in Section 111(a)(7) of the NWPA) and because such concerns provide the basis from which individual, group, and community response may occur.

Two basic types of response identified in the literature on so-called special effects are (1) individual-level psychological responses that could range in severity from apprehension, anxiety, and fear to psychological and physiological manifestations of stress (these responses have been a particular focus of the TMI literature) and (2) group behavioral responses such as the potential for community conflict (relating directly to the

repository or reinforcing and extending existing value differences) and a decline in trust in governmental institutions.

Evidence to support the possibility of such responses may be drawn from analogous cases. While none of these cases is perfectly analogous, each has important parallels. These cases include the Three Mile Island (TMI) studies on the potential effects of the proposed restart of the undamaged reactor (see Walker et al., 1982; Sorensen et al., 1983); the socioeconomic effects of nuclear generating stations (see especially the NRC post-licensing studies prepared by Chalmers et al., 1982); and community response to the proposed MX missile siting in Nevada and Utah (Albrecht, 1983).

Both the TMI studies and the post-licensing studies of nuclear generating stations examined public response to concerns about nuclear facilities. The former studies examined a situation of heightened concern about nuclear facilities, focusing particularly on the potential for psychological stress associated with the proposed restart of the undamaged TMI reactor. The latter studies, which were retrospective studies of socioecomonic impacts at twelve nuclear generating stations, focused on behavioral response. Responses included public involvement in the licensing hearing process and in political activities outside the public hearings. The time period covered was from the mid-1960's to the late 1970's. Thus, as the authors noted, responses must be evaluated in a context of "evolving safety regulations, changing patterns of regional and national concerns over the development of nuclear energy, and site specific events resulting from construction and operations activities" (Chalmers et al., 1982).

Findings of the post-licensing studies were that, prior to the TMI accident, variations existed in response among the 12 areas studied; however, overall, community conflict did not emerge because of a nuclear facility. Rather, "controversy over nuclear plants may reinforce, heighten, and polarize values and political positions" (Chalmers et al., 1982). Values that tended to be related to plant support were pro-growth community norms, whereas conservation and environmental organizations were the nucleus for the formation of an antinuclear group or constituency. In addition, in most of the cases studied, local opponents of the nuclear plant siting challenged the process through the formal legal channels of the hearings process. In two of the twelve cases there were lasting effects on the political structure; in the remaining ten cases, political activity and opposition "dissipated to a large degree" following a decision on construction or operation. However, after the TMI accident, evidence was found of heightened and increased concern over the nuclear plants. Public concern was shortlived and minimal at five sites and serious at seven sites (Chalmers et al., 1982). The seven sites had witnessed previous active nuclear opposition or were experiencing operating problems; opposing environmental organizations existed.

Albrecht (1983) has compared the proposed siting of a repository with that of the MX missile, noting the "highly volatile" nature of the siting of "highly controversial technologies." A particular point highlighted by Albrecht is that Federal projects, which address a national concern, but which require only a few rural areas to bear the impacts and potential risks, raise important equity questions -- and an associated potential for negative responses at the community level. The author identified actual community responses to the proposed siting of the MX missile in Nevada and Utah, and

drew a direct parallel between the types of concern expressed over the MX siting and concerns that have been identified by other authors as important public concerns about repository development. These are: concerns over public involvement, confidence in Federal and nuclear industry decision-makers, uncertainty about expert testimony, risk and equity issues, and the problem of security. In the case of the siting of the MX missile, concerns were expressed in behavioral responses such as protest, controversy, and community mobilization.

For evaluating these types of group behavioral response, the body of literature on community mobilization may be particularly relevant in suggesting factors that may be combined with attitudes to predict type and degree of response. (See Bridgeland and Sofranko, 1975, for a discussion of structural and issue-specific factors that affect mobilization; Wilkinson and Orum, 1976, for a succinct summary of different approaches to the questions of (1) why individuals become involved in collective political action, and (2) how political organizations succeed in mobilizing people for collective political action. Additional, selected, references from the mobilization literature are listed in the Theory and Methods (General) section of this report's bibliography).

1.5.4 CONCLUSION

It must be re-emphasized, as first noted in Section 1.5.3, that the division of the potential effects of construction and operation of a high-level waste repository into standard and special effects is conceptual only. "Special" responses to repository construction and operation are based essentially on attitudinal/perceptual factors concerning radioactive waste. In reality, attitudes are multi-dimensional; the development of attitudes towards the repository can be understood in the context of the way an individual selects and integrates new information in light of current beliefs, attitudes, and values. Attitudes (and associated responses) will incorporate a range of concerns, some of which may be related to perceptions of risk, equity, and other special factors, and some of which may be related to more standard concerns, such as concern that valued way of life may be affected by an influx of population.

Moreover, the planning, participation, financial and technical assistance, and mitigation requirements of NWPA are broad. They are unique in their recognition of the need for and provision of financial assistance to mitigate impacts. These provisions will apply to all identified potential social effects. In sum, therefore, the NNWSI Project needs to develop a plan that is sufficiently broad and flexible to assure that all identified potential significant adverse social impacts are evaluated.

CHAPTER 2

CONCEPTUAL FRAMEWORKS

2.1 INTRODUCTION

A conceptual framework provides a foundation for the social impact assessment (SIA) process. It lays out a system of variables, highlights the interrelationships among them and the importance of systematically tracing through their linkages (Finsterbusch, 1977). This chapter provides a brief background discussion on some basic differences between approaches to SIA, followed by an outline and evaluation of a variety of frameworks that have been proposed or used in the process of SIA. The underlying purpose of the review is to identify the essential components of a comprehensive plan appropriate for the assessment of the potential social impacts of repository construction and operation by the Nevada Nuclear Waste Storage Investigations (NNWSI) Project.

For each of the frameworks reviewed, an overview is presented of the (1) basic orientation, (2) variables and unit of analysis selected (i.e., whether the researcher's aim is the measurement of well-being as experienced by the individual or measurement at the group, community, or institutional level), (3) methods of data collection and analysis, and (4) model of social change explicity adopted. The concluding evaluation of each framework is based on an assessment of its strengths and weaknesses.

Following the review of individual frameworks, Section 2.11 summarizes (1) particular strengths that can be identified, (2) common elements that can be discerned, and (3) different aspects of social life that have been examined. Section 2.12 recommends a scope of work for the NNWSI Project based on these strengths, common elements, and different facets of social life, and on unique features of the NNWSI Project, as discussed in Section 1.5. The five basic components of such a plan are presented in Table 2-2 of Section 2.12. Section 2.13 concludes with a brief review of the Chapter.

2.2 BASIC DIFFERENCES IN APPROACHES

Three basic differences can be discerned among the frameworks discussed in sections 2.3 to 2.10. First, theoretical and philosophical approaches to the study of social phenomena differ; second, different social units of analysis have been selected as the focus of research; third, the frameworks reviewed have been developed for different purposes. These differences are discussed briefly in this section.

2.2.1 POSITIVIST VERSUS NATURALISTIC APPROACHES

As Pelto (1970) has emphasized, all research is structured in terms of some sort of theoretical constructs even though the constructs may be implicit and unrecognized by the researcher. More basically, behind any approach to the study of social phenomena lies a particular view of reality, a theoretical

paradigm (Kuhn, 1970), the importance of which is highlighted by Smith and Manning (1982):

> Theoretical paradigms are intellectual frameworks that more or less fit some aspect of the empirical social world. Paradigms point out significant problems, provide conceptual models and concepts for analysis and specify criteria for the evaluation of the quality of scientific work.

A distinction can be made more generally between two paradigms, or broad orientations to the study of social phenomena, that underlie the selection of a particular SIA framework (Livesay, Boyer, and Harding, 1984; see, however, Cook and Reichardt, 1979). These approaches are (1) the structural (sometimes termed positivist) approach and (2) the naturalistic (also called perceptual or interpretative) approach. This distinction is used in the discussion of frameworks in this chapter and is pursued further in the discussion in Chapter 3. The terms are used in a very general sense (see, for example, the discussion concerning structuralism in Keat and Urry, 1982, and the reference to positivism in Cook and Reichardt, 1979).

In the structural approach, society is analyzed in terms of its basic, aggregate characteristics. This type of research tends to examine social facts as things that constrain individual action. These facts and causes are explained without consideration of the perceptual states of individuals. This approach is most clearly seen in frameworks that use objective social indicators of the basic aspects of community structure (regularized patterns of behavior that perform vital community functions) to predict future social changes. The approach tends to express a conception of scientific method modeled after the natural sciences, which emphasizes testing of theories, using explicit, standardized procedures and formal manipulation of quantitative data.

The naturalistic approach views social reality as it is perceived by the individual or group. The objective situation affects humans through their perception of the situation. SIA, in this view, must include an assessment of the meaning of change to the individuals or groups concerned; the focus is on beliefs, attitudes, and values of social groupings and on underlying patterns and issues. Because people perceive, experience, and value things differently, this approach makes explicit the distributional nature of impacts. Methodologically, the researcher tends to seek an understanding of cognitions and behaviors in their natural context, rather than to attempt manipulation of the research setting. In place of the formal analysis of the positivist, as described above, the naturalist adopts a "grounded

theory" approach (Glaser and Strauss, 1967) in which hypotheses follow (rather than precede) the search for significant questions (Denzin, 1971)[1].

Most of the frameworks reviewed in this chapter can be placed along a continuum on the positivist/naturalistic axis. Two frameworks represent ideal types of each approach. Social Indicators Model 1 (Section 2.7) analyzes quantifiable structural changes without consideration of the meaning of those changes to potentially affected persons (positivist approach); ethnography (Section 2.6) attempts to obtain a record of the people and to describe the effects of a project in terms of their frames of reference (naturalistic approach). Other models are either atheoretical or empirical in nature (Social Assessment Manual (SAM), Section 2.3; and Multi-Attribute Trade-off System (MATS), Section 2.10) or represent a planned integration of perceptual and objective data (Group Ecology Model (GEM), Section 2.4; Social Organization Model, Section 2.5; and Social Indicator Models 2 and 3). As Simmel (1971) has noted, social life has both a contextual dimension that gives it form and an interpretative dimension that provides it with content. Thus, planned integration of the objective, structural reality and the perceptual reality of study groupings can provide a more adequate SIA. Particularly in the early practice of SIA, however, the combination of approaches was frequently ad hoc, with little explicit recognition of their theoretical bases or apparent attempt at a conscious integration of approaches.

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[1]The approach sometimes incorporates a political and strongly participatory orientation in which SIA is viewed as a community development activity aimed at "influencing the political forces that make decisions about projects" (Canadian Environmental Assessment Research Council [CEARC], 1986). In general, this orientation is particularly evident in the Canadian SIA literature. (See CEARC, 1986, for a comparison of technical and political models of SIA. Related discussions are included in Tester and Mykes, 1981; see, especially, the chapters in Tester and Mykes by Carter, Torgerson, and Tester.) U.S. writers have tended to distinguish between SIA and public involvement activities in terms of their respective emphasis on analysis (either positivist or naturalistic) versus involvement in decision-making (Branch et. al., 1984; Daneke, Garcia, and Priscoli, 1983). Public involvement activities of Federal water resource agencies, which are required by regulation, typically have been more structured and oriented to formal decision-making and are not necessarily tied to a naturalistic viewpoint, e.g., MATS (Brown and Valenti, 1983), which is discussed in this chapter. A discussion of the relationship of SIA to policy making and planning, including its value-related and political aspects, is provided by Carley and Bustelo (1984) and the references provided therein; for critical discussions of SIA by American authors, see Schnaiberg, 1977; Shrader-Frechette, 1982; Jobes, 1985; and Freudenburg and Keating, 1985.

2.2.2 UNIT OF ANALYSIS

Finsterbusch has emphasized the importance of classifying potential social impacts according to the social unit being affected . Differentiation of impacts is recommended because "different social units require different analytic operations." Distinctions are made among impacts on (1) individuals, (2) organizations and (formal) groups, (3) communities, and (4) societal institutions or systems. The latter may require assessment only for particularly "consequential policies" (Finsterbusch, 1977; Finsterbusch and Motz, 1980).

A primary difference revealed in the frameworks discussed in this chapter are between those that select individuals as the unit of analysis and those that select the community. Where individuals constitute the unit of analysis, they may be classified into "status categories" (Finsterbusch, 1977) or informal groups; the use of sample surveys, for example, permits the classification of individual reponses into groups of interest to the researcher. Theoretically, where communities are selected as the unit of analysis, the focus is on the capacity of the community to provide for the well-being of its residents.

2.2.3 SIA FRAMEWORKS

Frameworks reviewed in this chapter include (1) the Social Assessment Manual (SAM) developed by Fitzsimmons, Stuart, and Wolff for use in water resource planning; (2) the Group Ecology Model (GEM) developed by Flynn and Flynn; (3) the Social Organization Model prepared for the U.S. Department of the Interior, Bureau of Land Management; (4) ethnography, which constitutes a behavioral science in its own right; (5) three social indicators models; and (6) the computerized Multi-Attribute Trade-Off System (MATS) used by the U.S. Department of the Interior, Bureau of Reclamation. The frameworks reviewed have not been developed for similar purposes. While most have been developed for application across a broad range of potential impact situations and have been used or proposed in the process of SIA under the National Environmental Policy Act of 1969 (NEPA), some have been developed for more limited application. The latter, more specific models, include Social Indicator Models 2 and 3 (Sections 2.8 and 2.9) and the MATS Program (Section 2.10). Despite their more limited application, however, they provide insights that contribute to the purpose of the report.

2.3 THE SAM FRAMEWORK

The Social Assessment Manual (SAM) (Fitzsimmons, Stuart, and Wolff, 1977) was developed for, and has been used extensively by, the Bureau of Reclamation in the U.S. Department of the Interior. The SAM is essentially atheoretical. Variable selection, units of analysis, and tabulation and evaluation of impacts are designed to meet the requirements of the Other Social Effects Account of the Principles and Standards (now termed Principles and Guidelines) that regulate Federal water resource planning (Appendix A includes discussion of the accounts).

2.3.1 VARIABLES AND UNIT OF ANALYSIS

Well-being is measured in the SAM framework for five units of analysis: individual, community, area, national, and aggregate. For each of the five components, an extensive list is given of variables for which data are to be collected. For example, the individual/personal effects component requires data on six "evaluation categories": health; life, protection, and safety; family and individual; attitudes; environmental considerations; and other. Twelve evaluation categories are listed for the community/institutional effects component; they include, among others, demographic, education, housing, and neighborhood. Although the importance of sociocultural variables is discussed in the text of the manual, the collection of quantifiable secondary data dominates in the many pages of information needs to be met.

2.3.2 METHODS OF DATA COLLECTION AND ANALYSIS

The SAM requires extensive data collection and completion of numerous checklists. Data are to be collected primarily from secondary sources; however, informants and residents supply attitudinal data. The investigator rates impacts for each variable on a five-point plus or minus scale across alternative plans. These ratings are subsequently aggregated into four groups of overall effects in relation to current conditions. The goal is to make trade-offs among effects, both within and across plans, for four sets of measures: short- versus long-term effects; direct versus indirect effects; geographical distribution; and group affected.

2.3.3 MODEL OF SOCIAL CHANGE

The authors of the SAM briefly refer to a generalized "dynamic systems model." Little detail is provided about the model's theoretical implications.

2.3.4 EVALUATION

SAM represents an early stage in the development of SIA. The authors deserve credit for their attempt to relate social effects to other accounts of the Principles and Standards and for being among the pioneers of a systematic SIA approach on which later researchers could build.

Subsequent SIA frameworks discussed in this chapter have attempted to correct some of the weaknesses of the SAM framework that are listed below:

1. The framework emphasizes traditional economic, demographic, and infrastructure variables rather than sociocultural variables. In addition, changes that occur in economic and demographic variables are not linked explicitly to social changes.

2. Variables are selected by a checklist approach marked by the absence of a theoretically based foundation. There is no indication of how one variable relates to another nor of which variables are most significant for predicting change.

3. The attempt to combine impacts and present the effects of a project in terms of a single measure--in this case, columns of pluses and minuses--ignores the distributional nature of social impacts. It also appears to ignore the spirit of the National Environmental Policy Act (NEPA), which requires "open" disclosure of advantages and disadvantages, rather than "one best answer" (for a related discussion, see Freudenburg and Keating, 1985).

4. The measurement of variables and the rating and aggregating of effects is entirely subjective. These are critical aspects of the assessment process; however, they are not specified in replicable procedures.

2.4 GROUP ECOLOGY MODEL

The Group Ecology Model (GEM), first reported by Cynthia and James Flynn of Social Impact Research, was developed in conjunction with personnel from Mountain West Research, Inc. It was applied in the Nuclear Regulatory Commission (NRC) retrospective studies of the social and economic effects of nuclear power plants (Chalmers et al., 1982) and has been used subsequently in a number of Environmental Impact Statements (EISs). The most recent version is shown in Figure 2-1. The model is naturalistic in orientation, emphasizing the meaning of change to social groups in the study area. However, it also aims to integrate perceptual data with economic, demographic, public service, and other objective changes that are projected to result from a project.

2.4.1 VARIABLES AND UNIT OF ANALYSIS

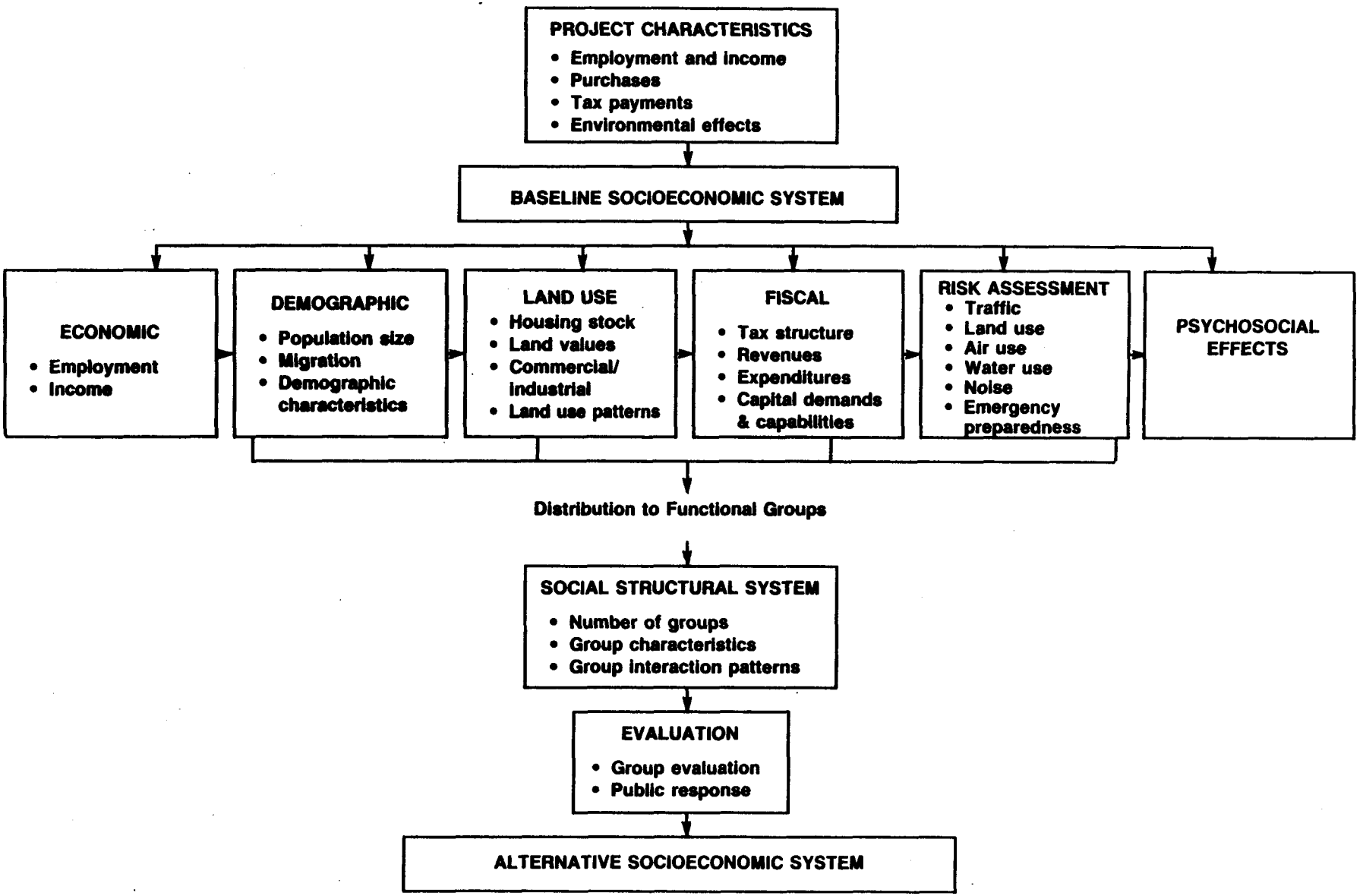
The unit of analysis is the functional (informal) social group. Unlike categorical groups, which are groups created by statistical aggregation (e.g., age, sex, geographical location), functional groups are sociocultural groups that are characterized by enduring patterns of behavior, based on shared values. The naturalistic orientation of the model is revealed in the emphasis on the groups' evaluations of the objective changes introduced by a project:

> The founding cornerstone of the functional group is their value systems, including attitudes, opinions, and beliefs. The final outcome is their evaluation of the proposed project and the subsequent patterns of behavior which either support or oppose its realization (Flynn, 1985).

Group profiles are developed, based on the following characteristics:

1. Attitudes, beliefs, values, and opinions--especially in terms of growth, environment, planning, and community participation (i.e., values that are directly related to a proposed project and will determine the groups' evaluation of project costs and benefits and their subsequent response).

Figure 2-1. Group Ecology Model (GEM).[a]



[a] Modified from Flynn (1985).

2. Livelihood of group members.

3. Property ownership.

4. Residential, occupational, and geographic location.

5. Group size and demographic makeup.

6. Institutional affiliations and other patterns of interaction among group members (cohesion).

7. Class and status.

2.4.2 METHODS OF DATA COLLECTION AND ANALYSIS

Unstructured interviews with key informants (persons who are knowledgeable about and can report on their community) constitute the primary data collection method. The investigator makes a preliminary identification of broad groupings based on secondary data sources; these identifications are refined following discussions with key informants. Social, economic, and political patterns of interactions within and among the groups are subsequently analyzed qualitatively to produce an "operational description of the social structure of the study area" (Flynn, 1985). The description is validated by concurrence on the part of local people. Economic, demographic, housing and land use, fiscal, and public service effects of the project, the structural changes that are estimated quantitatively by other members of the socioeconomic team, are qualitatively distributed among the functional groups.

2.4.3 MODEL OF SOCIAL CHANGE

Social structural changes are viewed as resulting from economic and demographic changes. Thus, changes in the social structure are projected to occur in the baseline (without-project) scenario as the result of changes in the demographic composition of the functional groups, changes in the economic structure of the study area, and national trends. In the with-project scenario, economic, demographic, housing and land use, fiscal, and public service effects are distributed among the functional groups. The resulting changes that are projected in group profiles and intergroup relationships are compared with the baseline scenario to assess changes in social structure that can be attributed to the project.

2.4.4 EVALUATION

The model has both strengths and weaknesses. Particular strengths are:

1. It can be viewed as the first truly social SIA model. The functional groups constitute sociocultural groupings of individuals whose patterned interactions are shaped by values. This approach is notable for its emphasis on evaluating the meaning of change and the likely behavioral response of informal groups or networks in the study area.

2. The social component is integrated into the overall socioeconomic impact assessment process by identifying the relationship between project-related changes in demographic and economic processes and subsequent changes in social structure. The model thus integrates both perceptual and objective data.

3. The emphasis on social groupings and on the role that they will play, based on costs and benefits that they expect to experience as a result of the project, recognizes the distribution of power and interest in shaping social effects. The model is a particularly valuable tool for understanding controversy that may accompany a project and for uncovering silent stakeholders (i.e., stakeholders who may not be aware of their interests). The analysis is not restricted by jurisdictional boundaries, and the model can be used to predict area-wide changes.

Particular weaknesses of the model are:

1. The model is limited in focus and presents only one aspect of social change. The focus is on the interaction within and among informal groups, on distributional effects, and on the meaning of change to these groups.

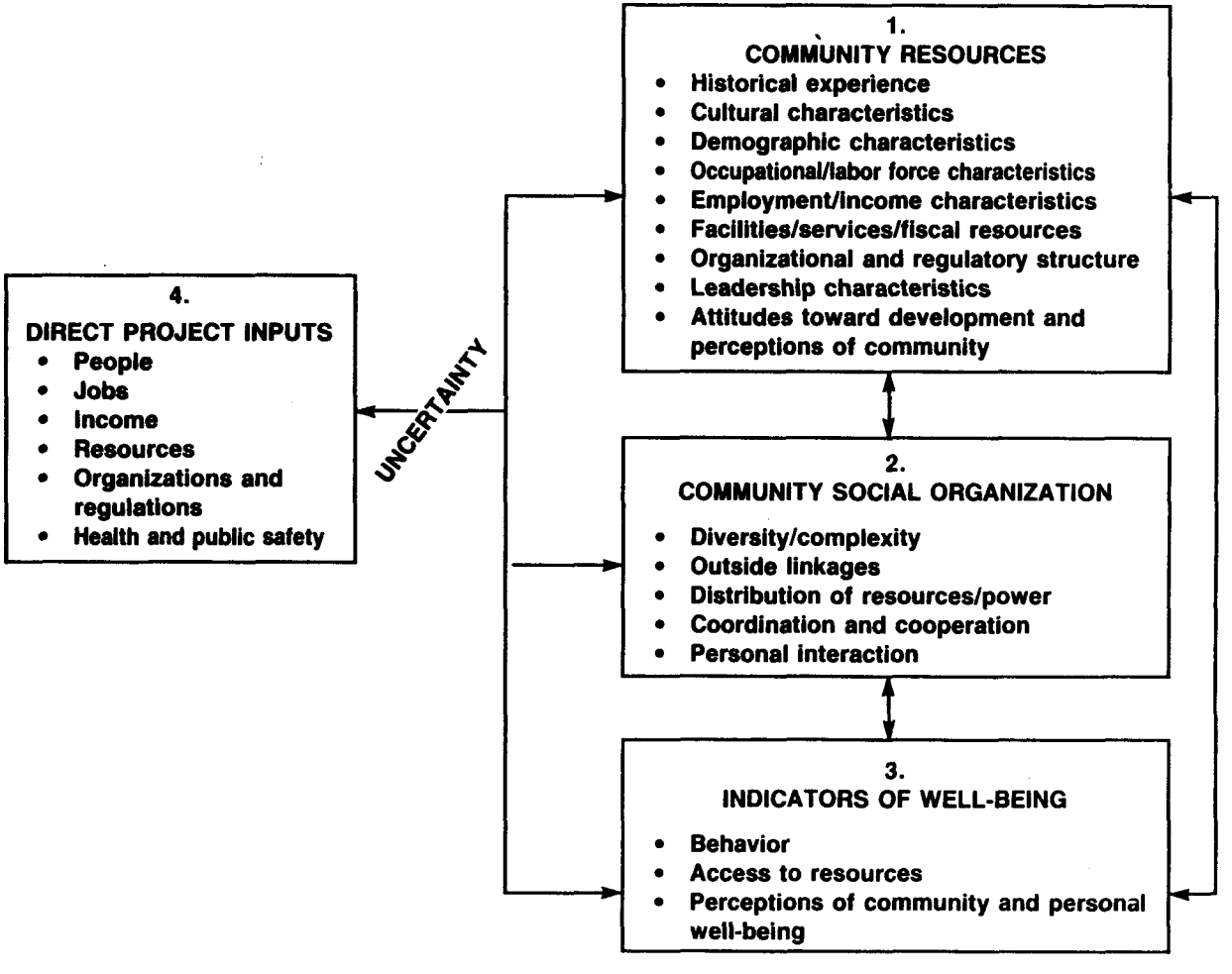
2. The discussion of methods is very brief. Investigators apparently rely primarily on information provided by key informants; however, there is little discussion of the advantages and disadvantages of the method or how it could be supplemented by other means.

3. The procedures to be followed in using the model are not clearly explained. The link between the risk assessment component and the social structure variables is far from clear. In addition, the process of distributing economic, demographic, and other project effects among groups (which is a particularly critical part of the model) is not spelled out in procedures that could be easily replicated by others.

2.5 SOCIAL ORGANIZATION MODEL

The Social Organization Model, shown in Figure 2-2, was developed by Mountain West Research, Inc. for the U.S. Department of the Interior, Bureau of Land Management (BLM) and has been used in the Powder River Coal, Draft EIS (DOI, 1984). It was published in 1982 as a manual entitled Guide to Social Assessment. The guide also appears with minor changes as a publication by Westview Press (Branch et al., 1984). It is similar to GEM in its naturalistic orientation and its emphasis on the integration of perceptual phenomena with objective changes that are projected to occur as a result of the project. The naturalistic orientation is revealed in the emphasis placed on assessing the meaning of project-induced (objective) changes to a potentially affected community. Attitudes toward development and perceptions of community are viewed as community resources, or input variables (Box 1), that will affect community response to a project and its consequences.

Figure 2-2. Social Organization Model. [a]



[a] Modified from U.S. Department of the Interior, Bureau of Land Management (1982).

2.5.1 VARIABLES AND UNIT OF ANALYSIS

The community is the unit of analysis in the Social Organization Model, and the focus is on the capacity of the community to adapt to and manage change.

As shown in the figure, the model comprises four components or groups of variables: project inputs, community resources, community social organization, and indicators of well-being.

2.5.2 METHODS OF DATA COLLECTION AND ANALYSIS

Recommended qualitative data collection methods include a wide variety of secondary sources, attendance at public meetings, key-informant interviews, and observation. Analysis, which is qualitative, is guided by a matrix that is used to identify "all possible combinations of inputs and community characteristics" (Branch et al., 1984).

2.5.3 MODEL OF SOCIAL CHANGE

In place of the social disruption thesis that implicitly guided much of the previous work in SIA (see Section 1.4.3) attention is focused on several key process-oriented variables that will affect a community's ability to adapt to project-induced changes. Specifically, these processes are diversity/ complexity, outside linkages, distribution of resources and power, coordination and cooperation, and personal interaction. As shown in Figure 2-2, a community's cultural, economic, and demographic resources (Box 1) as well as the community's underlying value system will shape the organizational processes (Box 2) that govern the quality of its social life (Box 3). The demographic, economic, and regulatory changes introduced by the project (Box 4) will interact with these processes. Communities that are differentiated, integrated, and accustomed to dealing with outside agencies will be more able to manage growth and will be less likely to experience standard boomtown effects.

2.5.4 EVALUATION

Strengths of the model are:

1. The model is a sociocultural model that integrates perceptual and objective data. Similar to GEM, social components are integrated into other aspects of the socioeconomic assessment such that projected changes in economic, demographic, public service, and fiscal components are systematically traced through social processes. The emphasis on perceptual phenomena and on the interaction between project inputs and community resources and social organization is noteworthy.

2. The selection of the community as the unit of analysis and the emphasis placed on the ability of a community to adapt to and manage change, highlights the need to assess the effects of a project on the capacity of the community to provide for the well-being of its residents. The model is explicitly based on Warren's concept of the community as both a social and a political unit and appears to draw also on the concept of community viability (see Bowles, 1981, for a succinct summary of the concepts of social vitality, local economic viability, and local political efficacy; see also Warren, 1978, and Cottrell, 1951).

3. By focusing on organizational processes, the Social Organization Model provides insight into how a community actually functions and how it is likely to be affected by project-related factors. This is an invaluable feature. Moreover, while the focus is on community, examination of community processes provides also a means of identifying the differential effects on individuals and groups within the community.

4. The components of community resources and community organization are particularly helpful to the investigator in the characterization of communities in a study area. Although the model's goal is the analysis of the standard effects of resource development in rural areas, the basic premise of the model--that the particular form of social organization in a community will determine how project inputs are handled by the social system--provides insight into the analysis of urban communities, and can be extended to incorporate the potential for special effects also. Thus, communities that are relatively differentiated and accustomed to dealing with outside agencies may be minimally affected by standard effects, yet they may experience special effects such as controversy/polarization because of the existence of social groups who may be more likely to perceive a negative effect on environmental values (Otway et al., 1978; Mileti and Williams, 1985; see also the discussion in Chalmers et al., 1982).

Weaknesses are:

1. The framework lays out an ambitious program of work; however, reliance on the methods suggested in the manual may provide an inadequate basis for the analysis of potential impacts of controversial projects that affect a wide area. The authors acknowledge that "formal surveys" may be appropriate in such circumstances; however, quantitative methods are barely discussed.

   Overall, in view of the proposed scope of work, the discussion of possible methods--analysis of secondary sources, key-informant interviews (apparently the major source of data), workshops/ meetings, field trips, and observation (apparently not extended participant observation)--is very brief. Particularly lacking are (1) guidance regarding differences in methods (e.g., their strengths and weakness, appropriateness for a given task, etc.) and (2) discussion of the problems of validity and reliability and possible procedures for controlling them.

2. The weakest link in the model appears to be at its most critical point. The final component--indicators of well-being--claims to integrate the information contained in the preceding two components and to integrate both subjective and objective components of well-being. The stated goal is to make a final summary determination of "whether and in what manner" a proposed action will affect "the well-being of individuals and groups in the community" (Branch et al., 1984). How this integration and summary determination are to be achieved is far from clear--especially in view of the brief guidance that is provided.

   Three particular weaknesses exist. The first is the failure to address a major problem identified by the authors themselves, i.e., that "people experience well-being as individuals" (Branch et al., 1984). This aspect of the model ignores an entire body of literature concerned with identifying and measuring the components of individual quality of life (see, for example, Andrews and Withey, 1976; Andrews, 1985; and the discussion in Section 2.9.2.1). No explicit distinction is made between assessing characteristics of individuals (which can be combined to produce an average value for the aggregate) and assessing characteristics of collectivities (e.g., the community as a whole). The second weakness (related to the first) is the failure to provide justification for the selection of "categories of indicators" that constitute well-being. The third weakness is the failure to establish a procedure for combining subjective and objective indicators, relating them to the "topic area" in a systematic way. This process, which is key to the analysis, is left to the discretion of the investigator. Problems of weighting or of establishing any type of replicable procedure are not even discussed.

2.6 THE ETHNOGRAPHIC FRAMEWORK

This framework differs from those described previously in that it is not a specific SIA model. Rather, ethnography is the study of culture and behavior and constitutes a behavioral science in its own right. The discussion of ethnography is included because it has been incorporated in modified form into most current SIA practice. It represents an ideal type of the naturalistic approach, contrasting sharply with the positivist, structural approach of the social indicator model presented in the following section.

2.6.1 VARIABLES AND UNIT OF ANALYSIS

Ethnography represents an emic approach, defined as an approach in which cultural behavior is studied and categorized in terms of the actor's frame of reference rather than in terms of classifications imposed by the investigator (Pelto, 1970). Research is viewed as a "process of discovery" (Lofland, 1971) in which the observer learns from those he/she is studying (Agar, 1986). Emergence and revision of analytical categories (a grounded theory approach, as describe in Section 2.2.1) is a key feature of the method.

2.6.2 METHODS OF DATA COLLECTION AND ANALYSIS

Ethnography studies people in their natural setting: typically, qualitative methods such as participant observation, key informant interviews, and study of local records are used.

Key features of the methods of data collection and analysis are the integral relationship of the researcher to the research (he/she is viewed as a research tool) and the emphasis on the interpretative role of the process. As both participant and observer, the ethnographer is intensely involved in the research process. He/she studies behavior from within, formulating hypotheses and testing them in the field rather than manipulating data to test pre-specified hypotheses. In the words of Agar (1986):

> Ethnographers set out to show that social action in one world makes sense from the point of view of another.... Ethnography is neither subjective nor objective. It is interpretative, mediating two worlds through a third [ethnographer as the mediator, intended audience, and group being studied].

2.6.3 MODEL OF SOCIAL CHANGE

The emphasis of the ethnographer is on description and synthesis of an understanding rather than on prediction. The uniqueness and emergent nature of social reality is emphasized.

2.6.4 EVALUATION

Ethnography, which traditionally has been used for the study of unique cultural groups, has been adapted for broader use into current SIA practice--typically, most SIAs include a brief period of participant observation or key-informant interviews. (For a more detailed discussion of the strengths and weaknesses of these methods, see this document's companion report, SAIC, 1986).

The strengths of ethnography stem from its holistic approach and emphasis on developing a "contextualized understanding of peoples' cognitions and behaviors" (Roper, 1983). As expounded by Roper, the ethnographic approach performs an integrative function in the SIA process by facilitating an understanding of data acquired by other methods. Particular strengths are:

1. The investigator is able to present the viewpoints and frames of reference of the range of potentially affected groups in the study area. The richness and range of insights developed from an understanding of the human context and the viewpoints of those who may be affected by project activities, provides an invaluable foundation and continuing reference point for studies.

2. Despite the emphasis on understanding rather than on prediction, the depth of understanding provided by studying group behavior, processes, and dynamics in their natural setting may prove, in fact, to be a comparatively superior predictor of actual events.

3. The approach may be particularly valuable for the study of values. The study of attitudes, values, and group processes in their natural setting enhances the researcher's ability to evaluate discrepancies that may occur between stated attitudes or values and actual behavior.

Ethnography is essentially a craft skill. Its weaknesses stem from the absence of clear procedures and the almost mystical attitude that is displayed by some practitioners. (See, for example, Wax's statement (1971) that "experienced field workers frequently tell beginners that there is nothing much they can tell them because each situation differs from every other"). Several scholars have noted that while data collection methods are frequently discussed, discussion of data analysis methods and the actual procedures of coding are notable by their absence (Miles and Huberman, 1984). In the context of controversial projects, attention to replicable procedures is essential.

2.7 SOCIAL INDICATORS: MODEL 1

Social indicator models are designed to specify variables for a system of indicators to measure quality of life; however, significant changes are apparent over time. Model 1, shown in Figure 2-3, which is the first of three social indicator models discussed in this chapter, was developed by Olsen and associates at the Battelle Human Affairs Research Center in 1978. Model 2, which was developed more recently by the same lead author, is more representative of the current state-of-the-art in SIA and is discussed in Section 2.8. Model 1 has been selected primarily for purposes of illustration. Specifically, it represents an early application of the use of social indicators to SIA and an example of an ideal type positivist approach, which focuses on quantifiable objective changes and does not take into account the meaning of those changes to potentially affected persons.

2.7.1 VARIABLES AND UNIT OF ANALYSIS

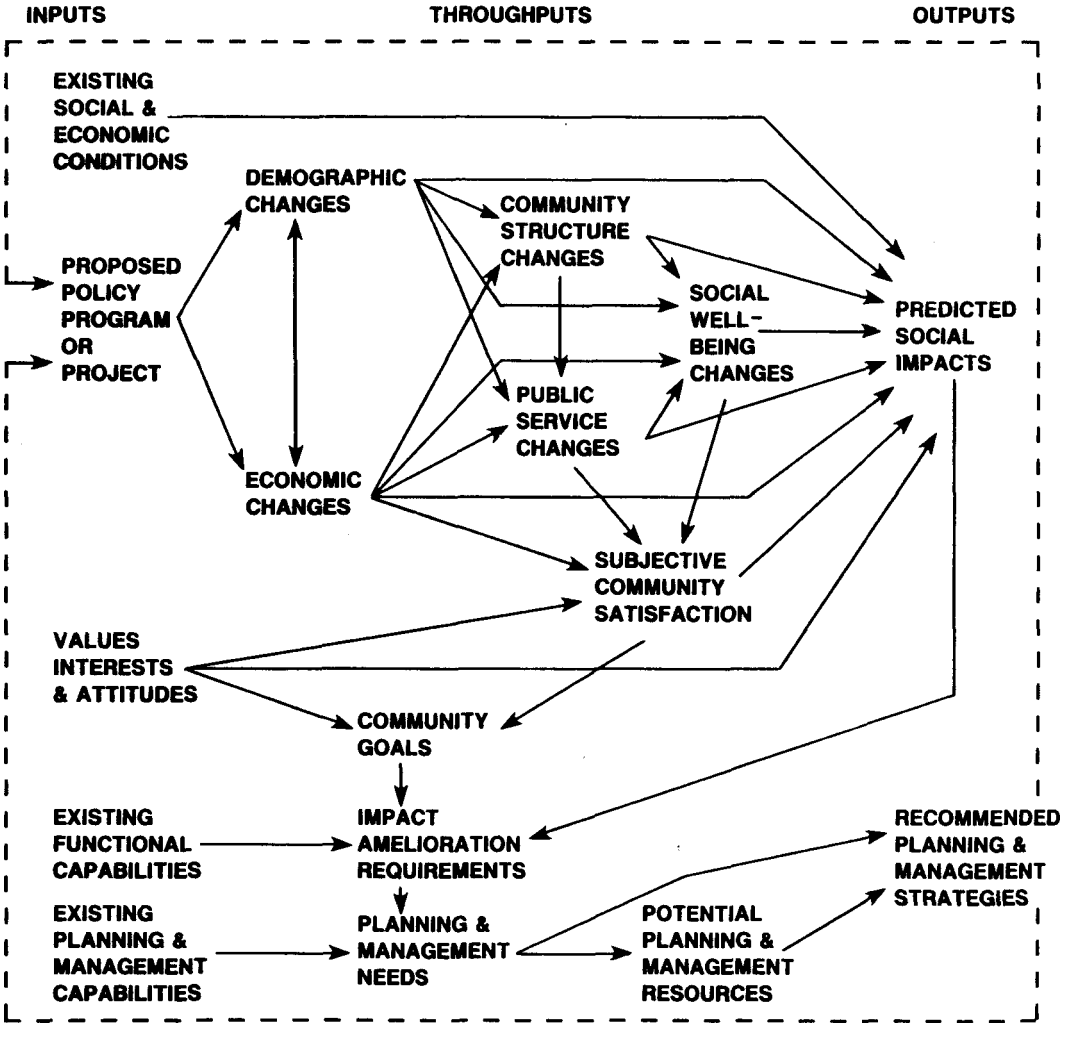
The community is the unit of analysis. The model aims to identify social impacts experienced by the affected people "as a result of changes produced in their community by the innovation" (Olsen et. al., 1978). Potential impacts are subdivided into five sectors: demography, economy, community structure, public services, and social well-being. Sectors are composed of between 8 and 12 factors (variables), each of which is measured by one indicator.

Factors listed for social well-being are minority opportunities, women's opportunities, economic security, economic equality, personal safety, property safety, personal stability, and family stability.

2.7.2 METHODS OF DATA COLLECTION AND ANALYSIS

The model requires secondary data collection and quantitative analysis. Information is gathered on 50 indicators (only half of which the authors

Figure 2-3. Social indicators—Model 1. [a]



[a] Modified from Olsen, Melber, and Merwin (1978).

believe may be "crucial") that are separately measured and reported. No weighting is involved. The authors propose that, prior to implementation, desired goals should be established for each indicator (by reference to local/regional values) followed by calculation of a standard score that specifies the degree to which its observed condition approaches the goal. Standard scores subsequently can be combined into composite indexes "provided that the problem of assigning weights to each of the indicators has been resolved in some way" (Olsen et al., 1978).

A series of flow charts is included with the report. They are designed to portray sets of probable causal relationships among the five impact categories and constitute a first step toward dynamic system modeling.

2.7.3 MODEL OF SOCIAL CHANGE

The authors explicitly note the grounding of their methods in the theoretical perspective of human ecology. Technological developments, resource scarcities, or government policies produce direct changes in the economy and population, which in turn lead to indirect changes in social structure and public service provisions as well as in the social well-being of the community. The extent of change will vary according to existing social, economic, and political conditions; values; interests; and attitudes and general satisfaction with their community as a place to live.

2.7.4 EVALUATION

Social indicators provide a replicable method for documenting social change. They may be a particularly valuable tool for monitoring, mitigation, and forecasting activities. However, many problems are apparent in this early model:

1. The definition of social impacts and the factors listed under social well-being are economic, demographic, and community service rather than sociocultural factors. Without exception, the factors would be compiled by the collection of secondary data. Perceptual variables such as subjective community satisfaction, values, interests, and attitudes are not included in the model. Thus, the meaning to persons in the potentially affected community of structural changes that occur in the economy, population composition, and infrastructure, is not taken into account.

2. Attempts to measure quality of life by objective indicators alone have been criticized by many researchers (Kuz, 1978; Meidinger and Schnaiberg, 1980; Carley, 1981, 1983; Ackerman and Paolucci, 1982; Andrews, 1985). Objective indicators and subjective evaluations of life quality may differ. As Carley emphasizes, "two important processes are at work"; first, similar objective conditions can elicit different subjective responses and, second, similar subjective responses can be given even though objective conditions may vary (Carley, 1983).

3. The use of objective indicators only restricts the analyst to collecting secondary data that can be readily obtained, rather than to developing indicators that may constitute more valid measures of the variables. Another problem is that comparable data may be difficult to obtain below the county level and at the level of small individual communities (such as those in Nye County).

4. The technical difficulty of developing "quantitative surrogates for unmeasurable concepts" (Carley, 1983) is compounded in the Olsen and associates' model by the selection of only one indicator for most factors. Typically, reliability and validity will be higher when several sources rather than single sources of information are used (Nunnally, 1978).

5. The authors' attempt to be comprehensive is not matched by the state-of-the-art of applied social science. Some of the limitations, which the authors openly acknowledge, are in fact crucial: the difficulty of combining standard indicator scores into composite indicators results in a large array of independent measures, and the inability to perform dynamic systems modeling results in an inability to use the indicators in forecasting.

6. A variety of value-related issues arise in attempts to use purely objective indicators:

   a. The validity of the model is highly suspect. Selected factors and indicators represent the researcher's values and not the values of potentially impacted individuals. Local persons, who were asked only to establish goals for preselected indicators, may have a very different definition of the components (factors) of life-quality.

   b. Even if standard indicator scores are combined into composite scores, the attempt to produce one number describing quality of life for an entire area ignores differential evaluations of life quality, and the distributive nature of social impacts (refer also to item 3 of Section 2.3.4 in the evaluation of the SAM framework).

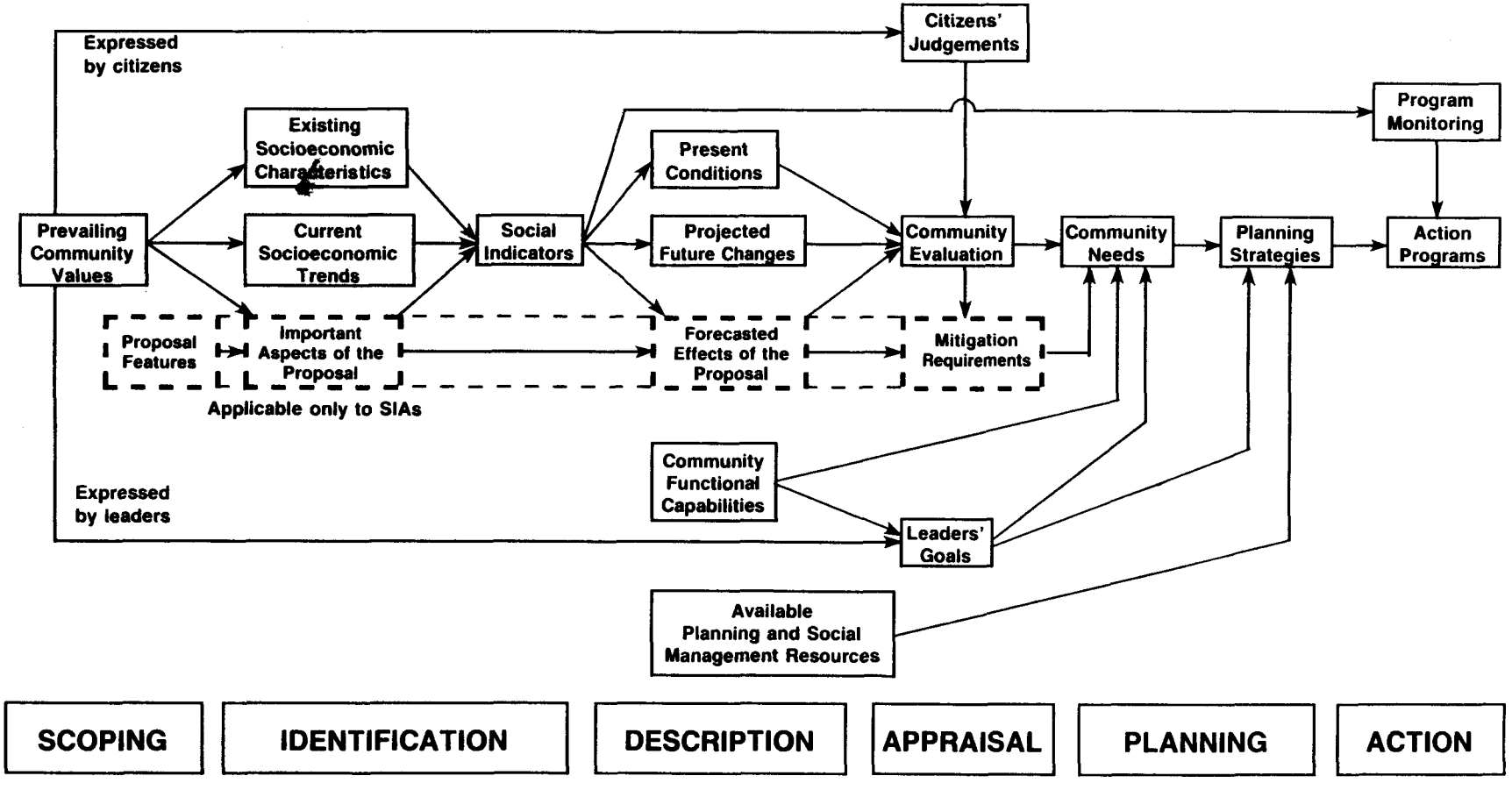
2.8 SOCIAL INDICATORS: MODEL 2

This later model of Olsen and associates, shown in Figure 2-4, reflects the authors' recognition of some of the problems noted above. Practical application is illustrated by a research project that was conducted on the Hawaiian island of Molokai. The authors emphasize that the model is not intended to provide a detailed methodology but is intended to be a broad guide for SIA and management.

2.8.1 VARIABLES AND UNIT OF ANALYSIS

The community is the unit of analysis. Representing components of life quality, variables are selected to correspond with residents' basic values. Selection of objective indicators is determined by their relevance to these values.

Figure 2-4. Social indicators—Model 2. [a]



[a] Modified from Olsen et al. (1985).

2.8.2 METHODS OF DATA COLLECTION AND ANALYSIS

Quantitative methods are used and combined with community interaction that involves potentially affected residents in evaluating the investigator's statistical data and planning impact mitigation and management activities.

Two primary phases are outlined: (1) construction of a value profile of the community by means of an existing technique (the Galileo method) judged to be suitable in the particular social context and (2) selection of empirical indicators that match these previously identified value concepts and that could be used to forecast future without-project socioeconomic conditions. The indicators are used by the investigator to describe existing conditions and forecast community conditions to be appraised and managed by residents.

2.8.3 MODEL OF SOCIAL CHANGE

The authors do not refer explicitly to a model of social change.

2.8.4 EVALUATION

The model does not claim to present a detailed method that can be used across a broad range of situations. Therefore, it is evaluated in terms of the insights it provides that could be incorporated into social indicator approaches and in terms of possible weaknesses that may result if it were transferred to a different social context.

Valuable insights are:

1. The grounding of the concept of quality of life in the values of potentially affected persons, rather than the researcher's values, enhances the validity of the concept.

2. The abandonment of the attempt to produce a global measure of quality of life, replacing it with the measurement of particularly valued community features that are likely to be affected by a particular project, renders the approach more meaningful to those potentially impacted. It provides a tool that can be used to monitor and manage impacts of a project on particular domains.

3. The emphasis on interaction between community residents and evaluator and on integration of assessment activities with the mitigation and management of impacts is a constructive approach.

Possible problems in attempting to use the model in other contexts include the following:

1. As noted previously, the use of objective indicators only restricts the analyst to collecting data that can be obtained rather than data that may constitute more valid measures of the variables under consideration. A complete listing of indicators that were used is

not provided in the article; however, the one example provided illustrates this problem. The most important value concept discovered for Molokai residents was "family together" (Olsen et al., 1985). Three indicators were used to measure this value: number of marriages per year, number of births per year, and number of divorces per year. It is questionable whether these indicators alone are adequate to measure the stated value; one would expect to include some measure of the quality of family togetherness also.

The problem (familiar to many social researchers) is aptly summarized in the authors' words:

> This search [for available indicators of the 13 basic value concepts] proved to be quite difficult; data for many relevant indicators did not exist, were scattered among many diverse public and agency records, or were aggregated for the four islands of Maui County. Unfortunately, this situation is encountered in most rural communities, which severely hampers the use of empirical indicators in community assessments. We were able, however, to locate at least some indicators relevant to each of the 13 basic concepts, for a total of 68 indicators that had sufficient data points for time-series analysis (Olsen et al., 1985).

2. Use of social indicators involves aggregation of data. This may result in the masking of significant differences among community groupings and, thus, the distributional nature of social impacts. Olsen et. al. (1978) explicitly recognize that value profiles may be required for various class, ethnic, and other segments of a study area. If the model is proposed as the sole method of SIA (as appears to be the case in this instance), the investigator in a more complex social environment would face a trade-off between committing resources to the construction of a variety of value profiles (presumably, interacting with the relevant social groups) and accepting aggregated average quality of life scores.

2.9 SOCIAL INDICATORS: MODEL 3

This final example of the use of social indicators in SIA is contained in a report that describes the design of a data collection system that will establish a basis for the projection and monitoring of changes in the individual well-being of Alaska residents who may be affected by development activities on the Alaska Outer Continental Shelf (OCS) (Braund, Kruse, and Andrews, 1985). As with the Olsen models, the aim is to specify variables for a system of indicators to measure quality of life. It is similar to the later Olsen model in that it is grounded in the values of potentially impacted residents. Three major differences are (1) the variables (goals) in the Braund, Kruse, and Andrews OCS system are measured by a combination of subjective and objective indicators rather than by objective indicators

alone, (2) the OCS system does not claim to be the sole SIA method but constitutes one component of a broader research plan, and (3) the OCS system is designed to measure changes in individual well-being.

2.9.1 VARIABLES AND UNIT OF ANALYSIS

The list of social goals developed for this model reflect individual well-being for the study population. These goals incorporated universal concerns identified by previous researchers in the field and regional or culturally specific concerns. They are organized into a logical hierarchy of four goal families, goals, and subgoals.

The goal families are:

1. Cultural continuity.
2. Individuals and families that are able to function well in society.
3. Command over goods and services.
4. Social opportunities and participation.

These families, related goals, and subgoals are listed in Table 2-1.

2.9.2 METHODS OF DATA COLLECTION AND ANALYSIS

Quantitative data collection and analysis are supplemented in this model by qualitative methods such as key informant interviews. Secondary data are used for objective indicators; formal interviews with random samples of individuals are the primary source of data for subjective indicators. The data are analyzed statistically. Basic steps are (1) development of a preliminary indicator system, comprising a hierarchy of goals and indicators; (2) field testing the initial system; and (3) implementation and application.

2.9.2.1 DEVELOPMENT OF THE INITIAL HIERARCHY OF GOALS

As noted previously, a list of social goals that reflect individual well-being was developed from (1) a review of universal concerns identified in previous research and (2) analysis of regional or culturally specific concerns.

Lists of the components of quality of life compiled by the "expert/logical" and "empirical/statistical" approaches were compared (Andrews, 1985). Examples of expert/logical approaches, in which experts (usually government officials) develop a consensus, include the list of 8 main social concerns published by the Organization for Economic Cooperation and Development in 1973 and the 11 social indicators drawn up by the U.S. Department of Commerce (1977). This approach contrasts with the empirical/statistical approach used

Table 2-1. Alaska OCS families, goals, and subgoals[a]

Goal family	Goal	Subgoal
Cultural continuity.	Continued harvest of renewable resources.	Healthy wildlife population. Unrestricted access to traditional hunting and fishing areas. Presence of wildlife population in traditional hunting and fishing areas. Interest in and use of renewable resources.
	Continued traditional social relationships.	Continued cooperative activities. Continued sharing of renewable resource products and equipment. Continued extended family relationships. Continued respect for elders. Intervillage social relationships.
	Continued cultural supports.	Continued use of native language. Continued oral history tradition. Continued production of arts and crafts.
Individuals and families that are able to function well in society.	Healthy individuals.	Physically healthy individuals. Mentally healthy individuals.
	Individuals who are safe from harm.	Individuals who are safe from harm by others. Individuals who are safe from harm caused by their own actions.
	An educated and well skilled person.	Individuals who have received a basic education. Adults who have the education and skills necessary to obtain employment.
	Families that function well in society.	Prevalence of families as the primary social unit. Healthy relationships within families.
	Adequate leisure opportunities.	Adequate opportunity to interact informally with friends, family. Adequate opportunities to participate in recreation activities.
Command over goods and services	Sufficient income and equitable income distribution.	All households receiving minimum income required to meet basic needs. Most households experiencing real income growth.
	Sufficient opportunities for employment.	Sufficient number of local jobs. Sufficient opportunities for preferred jobs.
	Sufficient housing.	Affordable housing opportunities. Satisfactory physical living space.
	Sufficient food.	Sufficient food available. Affordable food.
	Sufficient personal goods and services.	Sufficient availability of goods and services. Affordable price for goods and services.
	Satisfactory community environment.	Satisfactory public services and facilities. Satisfactory physical environment.
Social opportunities and participation	Adequate local control.	Sense of local control. Confidence in institutions and leaders.
	Adequate participation.	Participation in routine processes of government.

[a]From Braund, Kruse, and Andrews (1985).

by Andrews and Withey in which representative samples of the public were surveyed and a list of major concerns was assembled from their responses. In the latter, approximately a dozen concerns were identified as being able to explain almost all of the variation among individuals in their overall assessment of life quality. The first 6 of these concerns, which accounted statistically for 49 percent of the observed variation, were sense of efficacy, family, financial situation, amount of fun, housing, and family activities (Andrews and Withey, 1976). It was concluded that the major difference between the two types of lists was that the empirical/statistical list included people's concerns with themselves as competent, efficacious individuals and concerns regarding family and close personal relationships (Andrews, 1985).

2.9.2.2 FIELD TESTING THE ORIGINAL SYSTEM

Locally and regionally specific goals were derived from concerns and values identified through analysis of regional periodicals, written statements by local groups, articles, and area and field study reports. A preliminary "working list" to be tested and refined in the field was drawn up and organized into four family goals, related goals, subgoals, and indicators (as in the final version presented in Table 2-1).

2.9.2.3 IMPLEMENTATION AND APPLICATION

Three types of data are collected: sample survey, secondary, and key informant interview (used minimally). The survey component uses a single questionnaire, which can be used repeatedly but is submitted only once to the Office of Management and Budget (OMB).[1] The use of available data is guided by three criteria: that the data are reported on a subregional or place-by-place basis; that they distinguish between levels of well-being of natives and non-natives; and that they are collected at least every five years.

2.9.3 MODEL OF SOCIAL CHANGE

No theoretical model is specified, and the approach is strictly empirical. The authors hypothesize that (in the given context) employment and renewable resource harvest are two aspects of the environment that are likely to be

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[1]The Office of Management and Budget (OMB), 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.

affected; changes in either may induce changes in all other aspects of the human environment. They propose to examine statistical relationships among social indicators and to use these as a guide in identifying project effects over the long term. Additional in-depth studies will attempt to explain the causes of changes that are identified by the indicator system.

2.9.4 EVALUATION

Although the system was designed for use in a specific cultural context (Alaska's rural coastal residents) the basic approach of the model could be adapted advantageously to different contexts. Several features appear to be of particular value:

1. The system is limited in its claims. It is not proposed as a comprehensive, all-embracing approach to impact assessment; rather, it is viewed as a supplementary tool that constitutes one component of an integrated assessment. This component is individual well-being or quality of life.

2. The system integrates into one measurement tool the many aspects of life that contribute to individual well-being. These include aspects such as the adequacy of income, services and housing in addition to family and social relationships.

3. As emphasized by the authors, the ideal social indicator system would include measures of objective conditions and perceived satisfaction with the conditions, plus aspirations. The combination of objective and subjective indicators, as undertaken in this model, captures the objective and perceptual aspects of social reality and strengthens the overall measures. Items designed to tap aspirations are also included for key subgoals: these types of measures recognize that perceived satisfaction is affected by the individual's expectations and desires. (A classic example is the failure of subjective measures of income adequacy to match objective increases in income because rises in income may be outpaced by rises in aspirations.)

4. The grounding of the system in regional and local cultural values avoids the problem of cultural imperialism and enhances the validity of the concept of area residents' life-quality.

5. The system has been designed for monitoring social conditions over the long term and for integrating monitoring and projection phases. Relationships among social indicators can be examined, possible reasons for change can be explored (by means of complementary methods), and hypotheses can be tested and reformulated. Designed to accumulate a solid base of knowledge and understanding over time, this gradual process enhances the accuracy of forecasting. In addition, the ability to extend the measurement process to areas that are similar in cultural background yet unaffected by project activities likewise extends the investigator's ability to identify

project-induced changes. The approach is in striking contrast to that of the Social Indicators Model 1. The goals are much more modest, but they are also more in keeping with the state-of-the-art in applied social science and, hence, are more likely to be achievable.

Problem areas are:

1. The approach relies on questionnaire responses and is, therefore, subject to all of the advantages and disadvantages that typically accompany random sample surveys. In general, major advantages are the provision of a wealth of data that can be manipulated statistically to show relationships among variables, statistical representativeness, and precision. Major disadvantages are complex management and resource requirements (including the need for OMB approval), problems of validity and response set, and problems that may arise through repeated application of the instrument--maturation, reactivity, and bias in recruitment and retention are primary disadvantages of repeated surveys. (The report does not state whether panel or trend surveys will be used.) (See this document's companion report, SAIC 1986, for a detailed discussion of the different types of surveys and of the primary advantages and disadvantages of the random sample survey.)

2. Quality-of-life values that are obtained represent average scores only; this type of research does not indicate the distributive nature of social impacts. The authors of the report do not explicitly recognize the problem, and no specific techniques are suggested to bridge the gap (e.g., there is no follow-up on information regarding the distribution of scores and/or the adoption of complementary methods of research). However, the authors do state that the approach is part of an entire research program and not the sole method of data collection and analysis.

2.10 MULTI-ATTRIBUTE TRADE-OFF SYSTEM (MATS)

Multi-attribute trade-off analysis is not a new concept. However, MATS (Brown and Valenti, 1983) is the name of a specific interactive computer program designed as a tool for use in public values assessment which is a required part of SIA activities in water resource planning in the U.S. Department of the Interior, Bureau of Reclamation.

MATS has been selected for discussion as being representative of a number of approaches that basically are similar in concept although they may differ in a wide range of specifics. The concept is one of providing a systematic procedure for plan evaluation that involves the public. A similar concept is incorporated into the Social Analysis Plan proposed by Freeman and associates for use in management strategies for natural resource policies (Freeman et al., 1981). In contrast with MATS, Freeman (1) draws on an explicit theoretical base of "futures foregone" and "social conflict" and (2) uses delphi groups in place of a computer program as the process for resolving an issue. However, the two programs have essentially similar goals, i.e., the

provision of a systematic procedure for obtaining consensus on selection of water or land use plans that are highly controversial.

2.10.1 VARIABLES AND METHODS OF DATA COLLECTION AND ANALYSIS

The selection of variables and the methods of data collection and analysis are integrally related. Essentially, the procedure involved is one of performing trade-offs to reach a consensus on a plan's overall worth. Potentially affected persons play a participatory role in the process. The social investigator does not preselect variables for analysis. Rather, meetings of groups of stakeholders are convened (see Willeke, 1981, for a discussion of ways of identifying stakeholders) and representatives of these groups are required to make value judgments on factors that they select as critical in the evaluation of alternative plans. Technical experts place measures on the performance of each alternative plan on each factor, and the measures are subsequently transformed into utilities. The individual value judgments are combined with the utilities for every factor and aggregated to produce an overall desirability score for each alternative for each stakeholder group. Group scores are compiled with the purpose of revealing where there are possibilities for compromise.

2.10.2 MODEL OF SOCIAL CHANGE

The focus of the model is on involving potentially affected groups in deciding the direction of social change.

2.10.3 EVALUATION

As noted above, the MATS concept is not new, and as such, it suffers from both the advantages and disadvantages inherent in multi-attribute analysis. In general, the major advantage of multi-attribute models such as these lies in their ability to provide valuable insight into complex problems that involve a mix of facts and values and active interest groups. Particular advantages are that (1) they aid in the formulation of alternatives that include the range of concerns among the interested public, (2) they attempt to involve key decision-makers and key interest groups in the decision-making process, and (3) decision-making is conducted in an open deliberate manner, such that the parties involved may be more likely to accept the process itself.

However, the context of decision-making in the NNWSI Project differs from that of natural resource projects. Natural resource projects typically are concentrated within a relatively limited geographical area. A number of alternatives exist for which local members of the public can provide genuine input. This situation differs from that of the NNWSI Project, which involves a national program and national-level specific decision-making procedures. Realistically, State and local concerns cannot be dealt with in an in-person trade-off situation. However, there are situations within the overall project process in which local residents can play a genuine decision-making

role. Where local persons will be affected by decisions and can play a part in the actual process of making decisions, such an approach might be valuable. Given the existing organizational breakdown of roles within the NNWSI Project, this would be the responsibility of those involved in public information activities. However, the social analyst would be closely involved through provision of input regarding stakeholders and stakeholder concerns and in assessment of the process itself.

The major theoretical problem to be faced in attempting to aggregate from the individual to the group level is the lack of transitivity between any group preference function and individual preference functions (see especially Arrow, 1956, 1963). Freeman attempts to circumvent the problem by assuming that delphi participants change their initial preference orderings to a common preference ordering during the delphi iteration. MATS does not address the issue. Rather, the computer program is designed as a planning tool with a single individual providing input.

2.11 SUMMARY

Each of the frameworks discussed in this chapter has been oriented, in varying degrees, toward either a positivist or naturalistic approach; each has tended to rely on different types of methods (quantitative or qualitative); and each has focused on a different unit of analysis. However, since attempts to understand and predict social effects from one viewpoint and/or with one type of method only are unlikely to capture the complexity and diversity of social life, claims to comprehensiveness must be treated with caution. While no one framework is complete in itself, nevertheless, each has provided valuable insight into different features of social impact assessment. From the preceding review, this section summarizes (1) particular strengths that can be identified, (2) common elements that can be discerned, and (3) different aspects of social life that have been examined.

2.11.1 STRENGTHS IDENTIFIED

Particular strengths that were identified in the review of frameworks can be summarized as follows:

1. Ethnography, discussed in Section 2.6, could be used not only in its traditional application for the study of unique cultural groups in the study area, but also as a tool for understanding the values and frames of reference of area residents overall. In providing a "contextualized understanding" (Roper, 1983), it affords a foundation and continuing reference point for studies. As Roper has emphasized, the approach may be of particular value in performing an integrative function in the SIA process, by facilitating an understanding of data required by other means; this insight is pursued further in a discussion of the advantages of integrating field work and sample surveys in Section 3.3.

2. The Social Organization Model, discussed in Section 2.5, provides an excellent guide to the selection of variables for characterizing communities in the study area. The emphasis on the ability of a

community to adapt to and manage change highlights the need to assess the effects of a project on the capacity of the community to provide for the well-being of its residents. As noted previously, by focusing on organizational processes, the model provides insight into how a community actually functions and how its residents are likely to be affected by a project. This insight can be extended to incorporate the potential for effects in urban areas also.

3. The Group Ecology Model (GEM), discussed in Section 2.4, emphasizes the role played by functional or informal groups or networks. It also highlights the role of values and interests in shaping behavior patterns and the distributive nature of social impacts. The model provides a particularly valuable tool for understanding controversy that may accompany a project and for uncovering "silent" stakeholders.

4. Several features of the OCS Social Indicators Model (Model 3), discussed in Section 2.9, are of value and could be adapted to a different cultural context: (a) the system is grounded in the value systems of potentially affected persons; (b) it uses both objective and subjective indicators to integrate the many aspects of life that contribute to individual well-being (adequacy of income, services, housing, family, and social relationships); and (c) an integrated scheme of measurement and forecasting provides for comparability over time. Therefore, the method constitutes a particularly valuable tool for comprehensive long-term monitoring and for the gradual accumulation of a solid base of knowledge of statistical relationships among indicators that can be used to increase forecast accuracy. The researcher's ability to identify project-related changes can be enhanced if control communities are established (i.e., if the indicators are compiled for areas that are similar in cultural background but will be unaffected by project activities).

   An additional feature of the OCS indicator system is that the survey method that is employed permits the classification of individual responses such that average values can be obtained for a variety of groups of interest. The groups could include sociocultural groups, unique cultural groups, or a variety of statistical groups that previous SIA research has indicated as being particularly vulnerable to change.

5. MATS, discussed in Section 2.10, may be a useful tool for involving local persons in decision-making. While decisions regarding the final repository selection will be made at the national level, the planning and participation provisions of the NWPA provide opportunities for important decisions to be made at the local level: multi-attribute analysis can help in the formulation of alternatives that include the range of concerns among the interested public and in the involvement of key decision-makers and interest groups in an open, deliberate decision-making process.

2.11.2 COMMON ELEMENTS IN FRAMEWORKS EXAMINED

Elements common to recent, post-1980 frameworks are:

1. Assessment of attitudes and perceptions and their underlying value system. All recent frameworks emphasize the need to frame the study within the value systems of potentially affected persons and to assess attitudes and perceptions of a proposed project.

   The development of group profiles in the Group Ecology Model (GEM) requires the identification of groups whose patterns of interaction are shaped by values, in particular those that are related to growth, environmental planning, and community participation. The Social Organization Model emphasizes that an understanding of local community values enables the researcher to interpret the meaning of change to the affected persons. For the ethnographer, assessment of values is an integral part of the study of culture. And, finally, the selection of components of life quality in both the later model of Olsen and associates (Model 2) and the Alaska Outer Continental Shelf (OCS) social indicators system is explicitly guided by regional and locally specific values.

2. The integration of perceptual and objective data. This integration reflects the growing agreement among practitioners that both types of data are required in an adequate SIA (Freudenburg and Keating, 1982; Wolf, 1983; Finsterbusch and Motz, 1980; Chadwick, Bahr, and Albrecht, 1984; Carley and Bustelo, 1984; see also the discussions in Sections 3.2 and 3.3).

   Both the GEM and Social Organization models emphasize the integration of economic, demographic, and public service data with perceptual data to explain the meaning of change to area residents. As expounded by Roper (1983), the ethnographic approach may facilitate an interpretation and understanding of data acquired by the user of other methods. The Olsen Social Indicator Model 2 matches the selection of objective indicators with the previously identified values of community residents, while the OCS indicators system (Model 3) combines objective and subjective indicators in a comprehensive measurement of social goals that were developed with reference to local values.

2.11.3 FACET OF SOCIAL LIFE EXAMINED

The three facets of social life, or social unit of analysis, examined by the frameworks, are:

1. The community. The Social Organization Model emphasizes the capacity and willingness of a community to manage change. Both Olsen models attempt to forecast effects on community conditions.

2. The informal group. The GEM examines the values, attitudes, and social, political, and economic interactions of "functional" or informal groups.

3. The individual. The OCS social indicators system measures individual well-being.

2.12 RECOMMENDATIONS

This section recommends five basic components and constituent elements for future assessment of the social impacts of repository construction and operation by the Nevada Nuclear Waste Storage Investigations (NNWSI) Project. The five components, which are summarized in Table 2-2, are (1) community well-being, (2) individual and group well-being, (3) values, (4) attitudes and perceptions, and (5) institutional well-being.

Recommendations, which are synthesized from the review of frameworks in this chapter and from the literature discussed in Chapter 1, are specifically based on (1) inclusion of elements identified in the preceding section as common to post-1980 frameworks, (2) incorporation of particular strengths of the different frameworks, (3) inclusion of the full range of social units: individual, group, community, and the broader society, and (4) insights provided by Finsterbusch and Motz (1980). One insight, which may be particularly relevant for a first-of-a-kind radiological project, is the authors' recognition that each assesment context is unique and cannot be treated with a cookbook approach. Additional insights provided by Finsterbusch and Motz are: an emphasis on differentiating impacts by social unit of analysis; the recommendation to include assessment of institutional well-being for "consequential" policies; and a view of the role of SIA as one of anticipating the response of social units to impacts.

Elements included in the recommendations which follow are preliminary only. They are representative of the type of elements that require examination: a final list, including concept definition and methods of measurement, will be undertaken following the Environmental Impact Statement (EIS) scoping process.

2.12.1 COMMUNITY WELL-BEING/VITALITY

In this component, the community is the unit of analysis. Research on this component would draw on the strengths of the Social Organization Model, as identified in Section 2.11.1. Specifically, the research would adopt the model's variables for characterizing area communities, focusing on the processes of social organization in an integrated assessment of the potential for effects in urban as well as in rural areas.

The value of including this component in the SIA for the NNWSI Project would be an assessment of the willingness and ability of area communities to manage and adapt to project-induced growth and change. The assessment can be extended also to examination of community organizational and structural factors likely to affect public acceptability of a radioactive waste repository.

Table 2-2. Five basic components and elements of a recommended SIA[a]

Components and elements
Community Well-Being/Vitality
- Population characteristics; - Economic resources; - Facilities/services/fiscal resources; - Organizational processes; - Historical experience, cultural groupings, leadership characteristics; - Effectiveness of political, educational, and service institutions.
Individual/Group Well-Being
- Command over goods and services; - Physical/mental health; - Sense of personal efficacy; - Families that function well; - Personal interaction and support networks;
Values
Perceptions/Attitudes Toward Repository
- Knowledge of repository/radioactive material; - Perceptions; - Attitudes.
Institutional/System-Level Well-Being
- Coordination/effectiveness; - Trust in government institutions.

[a]Elements are preliminary only. They are representative of the type of elements that may require examination.

2.12.2 INDIVIDUAL WELL-BEING

The goal of the research in this second component, in which the individual is the unit of analysis, would be the identification and monitoring of changes in individual and group well-being.

The research would draw on the strengths identified in Social Indicator Model 3, as discussed in Section 2.11.1, to develop a system of social indicators that (1) is grounded in the value systems of potentially affected persons and (2) uses both subjective and objective indicators in an attempt to integrate and measure the aspects of life that contribute to well-being. Both of these features constitute features identified in Section 2.11.2 as common to recent frameworks.

The value of including this component in the SIA for the NNWSI Project would be the identification and monitoring of the many aspects of life that contribute to well-being. Three particular advantages of this type of analysis are that (1) the inclusion of both perceptual and objective data permits the integration of the subjective and objective components of quality of life for individuals or groups of individuals; (2) the survey method that is recommended permits the classification of individual responses into a range of social groupings of interest: these could include unique or cultural groups, sociocultural groups, and a variety of statistical groups that may be particularly vulnerable to potential change; and (3) the data provide for comparability over time.

2.12.3 VALUES

The assessment of local and regional values is a third component of a recommended social impact assessment. Rokeach's definition of the concept value underscores the significance of values in SIA. In his words, "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" (Rokeach, 1973).

As noted in the preceding summary section (Section 2.11.2), all recent approaches to SIA that were reviewed, emphasized the need to frame the study within the value systems of potentially affected persons. Based on Rokeach's definition, values provide a basis for interpreting events. They underly the validity of the concept of well-being and represent a foundation on which perceptions, attitudes, and responses to a proposed project may be based.

Assessment and understanding of local and regional values contributes to SIA by enabling the decision-maker to interpret the meaning of change to area residents. Moreover, an understanding of the basis for attitudes and perceptions enhances his/her ability to anticipate potential responses to repository construction and operation.

2.12.4 ATTITUDES AND PERCEPTIONS OF THE PROPOSED REPOSITORY

Residents' attitudes and perceptions of the proposed repository constitute the fourth component of a recommended SIA. Such research is a common element of all recent SIA frameworks that were examined. As succinctly stated over 50 years ago by Thomas and Thomas (1928):

> If men define situations as real, they are real in their consequences. The subject's view of the situation, how he regards it, may be the most important element for interpretation. For his immediate behavior is closely related to his definition of the situation, which may be in terms of objective reality or in terms of subjective appreciation - 'as if' it were so.

Assessing the "subject's view of the situation" may be particularly advantageous in enhancing the ability of decision-makers to anticipate the response of area residents to repository development. In the NNWSI Project context, attitudes and perceptions include an added dimension of attitudes and perceptions about radioactive waste. Potential negative responses, the so-called special effects of repository construction and operation that have been anticipated by the National Research Council (1984) as being likely to exceed standard effects, are related essentially to attitudes and perceptions about radioactive waste material.

While the relationship between attitudes and behavioral response is complex, analysis of attitudes and perceptions of the respository, in combination with other factors, will aid in anticipating public response. Attitude assessment that employs a statistically representative sample is of particular value in enabling the decision maker to explore the relationship among attitudes, beliefs or perceptions, and values; to reduce the multiplicity of key beliefs and attitudes to a smaller, more manageable number of key beliefs and attitudes that are determinants of overall attitudes toward the respository; and to assess, in combination with other factors, the likelihood, direction, and extent of behaviorial response.

2.12.5 INSTITUTIONAL WELL-BEING

In this component, institutional well-being is the unit of analysis: impacts on the broader society, such as institutional coordination, effectiveness, and legitimacy, are the focus of the assessment.

A variety of group and behavioral responses that have been cited in the literature as potential special effects of repository development could result in institutional or system-level impacts, as discussed by Finsterbusch and Motz (1980). Among the nine subcategories of possible institutional-level responses, these authors cite declining trust and legitimacy of governmental institutions, declining coordination, and blockage of corrective or adaptive mechanisms. Short (1984), and Lewis and Weigert (1985) also have emphasized the potential for decline in trust in governmental institutions.

Institutional well-being could not be distinguished as a separate unit of analysis included in the frameworks reviewed in this chapter. However,

Finsterbusch and Motz (1980) have recommended inclusion of institutional well-being for "consequential policies." Inclusion of this component in the NNWSI Project SIA would be of value in identifying factors that could have a significant effect on the cost and viability of policy implementation. This type of research also would indicate the potential for societal-wide social effects extending far beyond the area of immediate potential impact where inmigrating workers may settle.

2.13 CONCLUSION

This chapter has presented a brief discussion of some basic differences between approaches to SIA followed by an outline and evaluation of a variety of frameworks that have been proposed or used. Following the review of each framework, Section 2.11 summarized (1) particular strengths identified, (2) common elements discerned, and (3) different aspects of social life examined. Based upon these strengths, elements, and aspects of social life, and upon insights provided by SIA researchers, five components (presented in Table 2.2) were recommended for inclusion in an assessment of the potential social impacts of repository construction and operation by the NNWSI Project.

CHAPTER 3

METHODS OF DATA COLLECTION AND ANALYSIS

3.1 INTRODUCTION

This chapter discusses and recommends methods of data collection and analysis appropriate for the Nevada Nuclear Waste Storage Investigations (NNWSI) Project. Suggestions are made for (1) several criteria to be used in the selection of individual methods and (2) goals that should be met in the integration of methods into an overall research plan.

The overall approach that is recommended is a multifaceted, triangulated approach that is both interactive and inductive. Both qualitative and quantitative methods of data collection and analysis are recommended. An understanding of both the traditional distinction between qualitative and quantitative methods and the concept of triangulation is basic to the discussion of recommendations that follow, therefore, the chapter begins with a discussion of these concepts. It is followed, in Section 3.4, by a discussion of methods of data collection, methods of analysis, and approaches to forecasting. Recommendations for particular methods that can be used for components of the analysis and for an overall approach are presented in Section 3.5.

3.2 QUANTITATIVE AND QUALITATIVE METHODS

A basic distinction traditionally has been drawn between quantitative and qualitative methods. Quantitative methods such as the random sample survey are typically used to aggregate responses and be statistically represent the population under study. Qualitative methods disaggregate responses, permit the researcher to observe attitudes and behaviors in a natural setting, and promote depth of understanding; however, it is not possible to estimate precisely (as for the sample survey) the representativeness of the findings.

In the past, the division between the positivist approach (emphasizing quantitative methods of data collection and analysis) and the naturalistic approach (emphasizing qualitative methods of data collection and analysis) produced bitter disagreements among social scientists. Positivists emphasized the scope of their methods, the value of causal explanation, and the ability to generalize findings. Naturalists emphasized depth, i.e., the value of a holistic approach that seeks a comprehensive understanding of the meanings that guide human behavior and the uniqueness of social phenomena in place of a search for universal laws.

Increasingly, however, quantitative and qualitative methods are being viewed as complementary rather than as alternative ways of studying social phenomena. For example, Cook and Reichardt (1979) emphasize that the traditional linkage between paradigm and method is one of definition and practice rather than one that is inherent and necessary. These authors recommend that the choice of a particular method (either quantitative or qualitative) be guided by the specifics of the research setting as much as by paradigm stance.

Scholars formerly associated with one side of the quantitative/qualitative debate have acknowledged the value of the other viewpoint. Campbell's quantitative, positivist orientation has shifted toward endorsement of the contribution of the qualitative naturalist approach (see, for example, Campbell, 1975). On the qualitative side, Yin (1982) has emphasized the need for greater standardization of research procedures in qualitative research, while ethnographic data from single case studies have been used to develop generalizations that can be applied across cases (Smith and Louis, 1982). As Miles and Huberman (1984) note: "The paradigms for conducting social research have shifted beneath our feet and most people now see the world with more ecumenical eyes." (See also Fielding and Fielding, 1986.)

3.3 TRIANGULATION

A multistrategy approach to social research termed triangulation has been recommended for use in SIA (Chadwick, Bahr, and Albrecht, 1984). The concept of triangulation, as expounded by Denzin (1978a,b) and further elaborated by later scholars, provides a valuable guide for the selection and subsequent integration of methods into an overall SIA approach.

Four types of triangulation identified by Denzin are (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. Methodological triangulation comprises "within method" triangulation (for example, the use of varieties of the same method such as three different scales to measure the problem under investigation) and "between method" triangulation (application of different methods to measure the problem) (Denzin, 1978a,b).

Denzin's argument for triangulation is primarily methodological, deriving from Webb's viewpoint that each method in social science has its own bias, or inherent weakness, that can be countered only by cross-checking with other methods (Webb et al., 1966). Thus, triangulation is recommended as "a standard for evaluating studies . . . the greater the triangulation, the greater the confidence in the findings" (Denzin 1978a). Two critiques of this argument are made by Sieber (1973) and Fielding and Fielding (1986). These critiques provide valuable insights that should be incorporated into attempts to employ triangulation in SIA.

Sieber's conclusion is that the task in social research is to integrate methods such that the strength of one contributes to the other. His critique is based on Trow's (1957) insight that "the problem under investigation properly dictates the method of investigation." (See also Cook and Reichardt, 1979). Sieber points out that each technique has not only an inherent weakness; it also has an inherent strength unmatched by other techniques. His examination of a combined strategy of field work and survey methods serves to illustrate the two-way contribution of approaches.

As Sieber (1973) notes, fieldwork (qualitative/unstructured) data collection can contribute to survey data collection by:

1. Providing the theoretical structure.

2. Validating results where information overlap occurs.

3. Interpreting statistical relationships.

4. Providing information on frames of reference of future interviewees (including the selection of survey items for the construction of indices).

5. Providing external validation of statistical constructs.

6. Providing illustrative ideal-type case studies.

7. Clarifying puzzling questionnaire responses.

Surveys can contribute to field work by:

1. Correcting the latter's tendency to the holistic fallacy (i.e., the tendency of fieldworkers to perceive all aspects of a social situation as congruent).

2. Providing measures of the generalizability or statistical representativeness of the findings.

3. Verifying field observations.

4. Explaining a previously inexplicable or misunderstood field observation.

Fielding and Fielding (1986) emphasize that triangulation of methods and theory will not, per se, increase the validity of findings or reduce bias. To capture the multifaceted nature of social life, the authors recommend the use of one perspective "from each side of the structural/interpretavist divide," using at least one method that is best suited to the structural aspect and one that can shed light on the meaning of a social phenomenon to the affected person. They note:

> Theories are generally the product of quite different traditions, so when they are combined one may get a fuller picture but not a more objective one. Similarly, different methods have emerged as a product of different theoretical traditions, and therefore combining them can add range and depth, but not accuracy. In other words, there is a case for triangulation, but not the one Denzin makes. We should add theories and methods carefully and purposefully with the intention of adding breadth or depth to our analysis, but not for the purpose of pursuing objective truth.... The analyst has ground rules but it is these which Denzin neglects... The ground rules for the selection of multiple theories and multiple methods issue from the basis and plausible assertion that life is multifaceted and is best approached by the use of techniques that have a specialized relevance.

3.4 DISCUSSION OF METHODS

3.4.1 METHODS OF DATA COLLECTION

A variety of social science methods, including their relative advantages and disadvantages, were discussed in this document's companion report (SAIC 1986). Quantitative data collection methods that were discussed included secondary data collection and sample surveys. Qualitative data collection methods that were discussed included participant observation, key-informant interviews, and group methods such as focus group discussions. Content analysis may be used quantitatively or qualitatively. The methods were discussed in terms of their application to the assessment of attitudes toward the proposed repository. However, the discussion of each method was sufficiently broad to permit extension to other aspects of the SIA process. Therefore, this report provides only a summary of particular strengths of methods that were discussed. Also included are social indicators that were not applicable to the assessment of attitudes, but which were discussed in Chapter 2 of this report. A summary of this information is presented in Table 3-1. It should be noted that the strengths listed in the final column of the table refer to the overall method of data collection rather than to the individual items listed under each method of data collection.

3.4.2 METHODS OF ANALYSIS

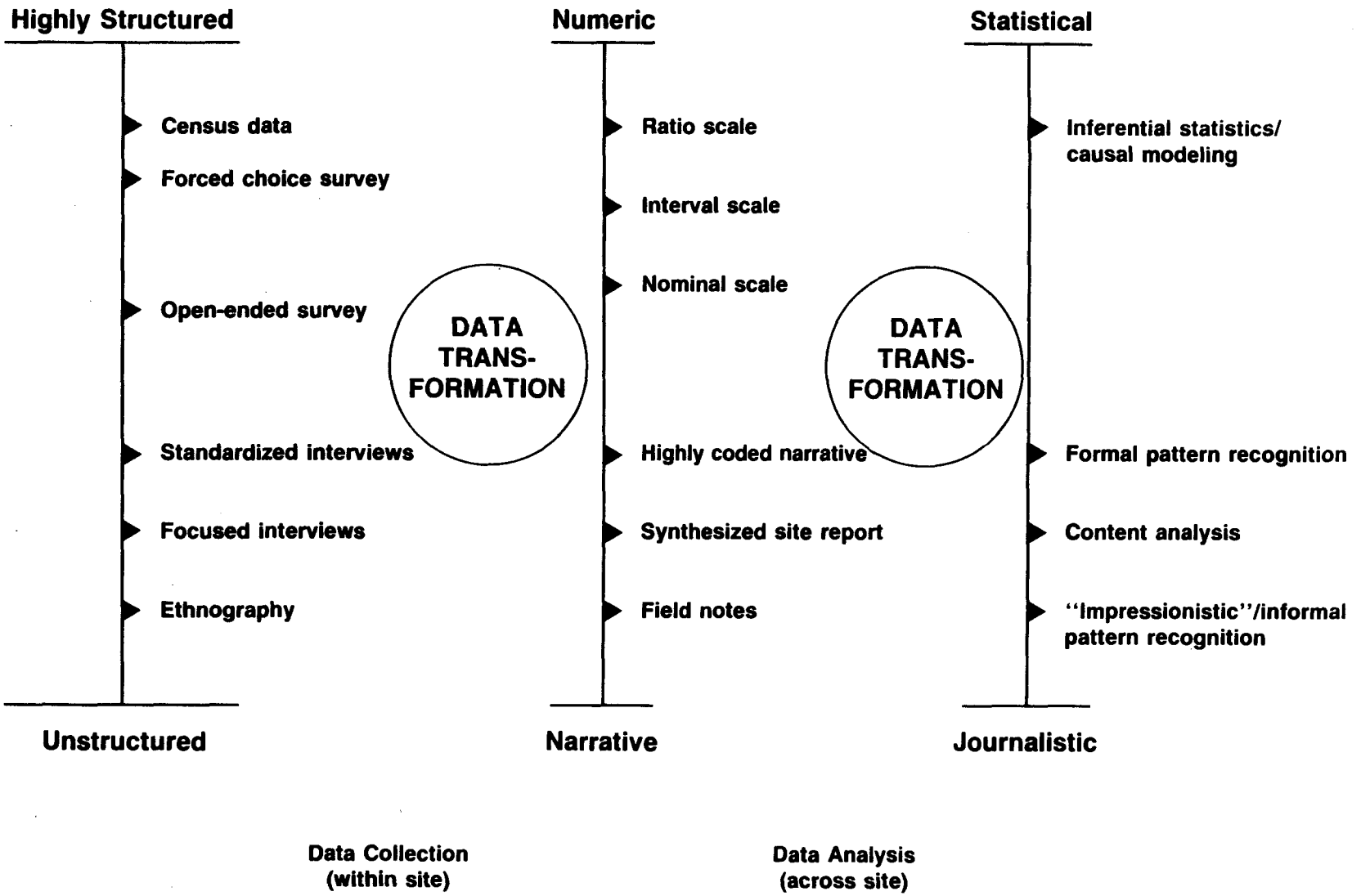
The previously cited conclusion of Miles and Huberman concerning the shifting of paradigms in social science research (see Section 3.2) is evidenced in changes that have occurred in the relationship between data collection and data analysis. Traditionally, definitions of the terms quantitative and qualitative have assumed a congruence between data collection and data analysis techniques, focusing on the distinction between numerical representation and statistical manipulation of numerical data (quantitative methods) and the interpretation of non-numerical data to discern underlying meanings and patterns of relationships (qualitative methods). (See, for example, Babbie 1986.) However, as Louis (1982a) has emphasized, collection methods are not necessarily followed by the same type of analytic method. She has suggested replacement of the terms quantitative and qualitative with distinguishing methods according to their position along a continuum between structured (formally organized) and unstructured (open, free, loose) methods. The author highlights data transformation as a distinct step between data collection and data analysis. By means of the intermediate step, data collected by unstructured methods could be coded and subsequently analyzed statistically; conversely, structured collection methods could result in qualitative analysis. This process is shown graphically in Figure 3-1.

To perform impact analysis (i.e., comparison of with- and without-project forecasts), numerical data might be analyzed statistically to identify relationships among variables, to monitor changes, and to predict behavorial and attitudinal responses to the repository. Non-numerical data could be analyzed qualitatively to discern underlying patterns or themes. Qualitative analysis encompasses a wide range of techniques, ranging from impressionistic/informal pattern recognition to more formalized coding techniques. In this instance, the ability to forecast is based on depth of understanding of group behavior, processes, and dynamics.

Table 3-1. Summary of goals and particular strengths of a variety of data collection methods

Method of data collection	Goal of method	Particular strengths of method
Secondary data collection	Provide information on community resources: demographic, ethnic, occupational characteristics, and resource base.	Affords an available, unobtrusive, and low cost option.
- Content analysis	Identify and monitor changes in concerns, about the project as reported in State and local newspapers.	
Ethnographic research		
- Key informant interviews;	Supplement secondary data sources, especially in provision of data on attitudes and interactions.	
- Participant observation;	Assess baseline values.	Provides a foundation and continuing reference point for studies.
	Identify informal networks/social groupings.	
- Study of local records, newspapers.	Identify current and historical community events, issues, actors, and organizational processes.	Enhances depth of understanding of residents' world views, social processes, and dynamics.
	Provide information on residents' evaluation of community life and the perceived effect of a proposed project.	
	Provide feedback on goals/subgoals for quality of life indicators.	May not require OMB clearance.
Social indicators.	Provide a valid and reliable method of monitoring and forecasting project-induced effects.	Allows for comparability of of data over time.
		Integrates subjective and objective data.
		Provides a comprehensive measure of the many factors that contribute to individual well-being.
Random sample survey.	Provide quantifiable data on attitudes, perceptions, and behavior.	Permits statistical analysis of attitudinal, perceptual, and behavioral data.
		Employs standardized, replicable procedures.
Group methods		
- Focus groups;	Aid in the design and pretesting of questionnaire items for formal surveys (exploratory groups).	May widen the range of responses and activitate forgotten details.
	Understand the worldview of particular social groups (phenomenological groups).	Provides for flexibility and use fora variety of purposes.
	Understand the processes of attitude formation/ dispute resolution strategies.	May not require OMB clearance.
- Delphi or working groups (using local persons).	Aid in forecasting impacts.	Permits local involvement.
		Requires open display and discussion of core assumptions.

Figure 3-1. Dimensions of variation in data collection and analysis in multimethod/multisite case studies. [a]



[a] Modified from Smith (1982).

3.4.3. APPROACHES TO FORECASTING

A wide range of specific forecasting techniques can be used to supplement qualitative pattern identification and quantitative techniques. Miller has identified 12 main techniques, categorized into the following 3 broad groups: (1) statistical time series and projections, (2) computerized models and simulation, and (3) qualitative and holistic techniques (Miller, 1981). This section provides a brief outline of the three broad categories. Primary advantages and disadvantages are shown in Table 3-2.

3.4.3.1 Statistical time series and projections

These methods include trend extrapolation, pattern identification, and probabilistic forecasting. All are based on a historical data series that is analyzed statistically to forecast the future. For example, in trend extrapolation that would be used in the analysis of social indicators, a variety of mathematical techniques determine future values for a single variable by identifying relationships between past variables' values. Simple and multiple regression, moving averages, substitution and growth curves, and exponential smoothing are some of the mathematical techniques used.

3.4.3.2 Computerized models and simulations

This category includes a wide range of techniques that focus on the interaction for separable elements and their combined overall effects. Some of the most well-known, which can be used in social forecasting, include cross-impact analysis, dynamic modeling, and policy capture (although the latter technique is more oriented to policy evaluation and use as a public participation tool).

3.4.3.3 Qualitative and holistic techniques

Qualitative techniques include scenarios, alternative futures, expert opinion methods such as delphi, and values forecasting. These essentially intuitive techniques may also incorporate information from statistical and modeling techniques.

The delphi technique, which is discussed in this document's companion report (SAIC, 1986), involves the solicitation of experts' (who could be local experts) opinions according to a specific iterative format. The technique could be used alone or combined with any of the other qualitative methods as a means of pooling judgments. Scenarios are projections of the future from present conditions under specific economic, political, and social assumptions. The process has been described as "an imaginative narrative of possible alternative futures based upon assumptions and analyses regarding trends and events. We are dealing with sufficient and not necessary futures" (Vlachos, 1981, see also Gerardin, 1973; Abt, Foster, and Rhea, 1973). Vlachos has identified four generic types of scenarios: (1) extrapolative scenarios that are based on consequences that are reasonably expected,

Table 3-2. Advantages and disadvantage of three primary groups of forecasting techniques[a]

Category/Technique[b]	Advantages	Disadvantages
Statistical Time Series	Explicit.	Assume that past trends are an indicator of the future.
- Trend extrapolation;	Replicable.	Limited to predicting variables for which quantitative data are available.
- Pattern identification;	Easily understood	
- Probabilistic forecasting.		Cannot take into account the interaction of multiple variables.
Computer models and simulations	Unique combination of explicitness and comprehensiveness.	Errors in the initial subjective forecast may be compounded in the interactive process that occurs. Thus, results may be impressive but entirely inaccurate.
- Dynamic systems modeling;	Outstrip human capacity for probabilistic thinking.	
- Cross impact analysis.	Permit exploration of interactive relations and identification of overall patterns that are more typical in real-life situations.	
	Especially useful as a heuristic tool in the exploration of an issue.	
Qualitative techniques	Provide a means of stimulating thoughts of analyst.	Essentially intuitive.
- Scenario construction;	For delphi and other methods that involve potentially affected persons in the forecasting process, the value of involvement may outweigh disadvantages.	Lack of validity; scenarios represent "imaginative narratives;" delphi forecasts represent Popper's long-term prophecies rather than "conditional scientific prognoses."
- Alternative futures;		
- Values forecasting;		
- Expert opinion methods (delphi)	For scenarios, the open presentation of integrated sets of events or conditions permits discussion and questioning of core assumptions that provide the basis for forecast accuracy.	Human judgement, including that of experts, has been shown to be fallible.

[a]Information for this table is summarized from Armstrong, 1985; Ascher, 1978; Ascher and Overholt, 1983; and Henshel, 1982. See also other sources listed in the bibliography (forecasting section).
[b]Specific techniques that are listed represent examples that have been selected primarily for purposes of illustration.

(2) normative scenarios that begin from a future desired goal and work backward to the present, (3) speculative scenarios that attempt to take into account unanticipated events, and (4) dialectic scenarios that subject the extrapolative and speculative scenarios to criticism in order to develop a third alternative.

3.5 RECOMMENDED SELECTION AND INTEGRATION OF METHODS

The preceding discussion suggests several criteria to be used in the selection of individual methods; additional criteria are suggested by the nature of the Nevada Nuclear Waste Storage Investigations (NNWSI) Project setting. It also suggests goals that should be met in the integration of methods into an overall research plan.

3.5.1 PARTICULAR METHOD SELECTION

Methods have been selected according to the following criteria:

1. Ability to capitalize on the inherent strength of a technique (Sieber, 1973).

2. Generalized provision of "within method" and "between method" triangulation (Denzin, 1978b; see also Webb et al., 1966).

3. Unobtrusiveness of the method. Reactivity between subject and measurement is a well-recognized factor in social science research. In addition to methodological concerns, the controversial nature of the NNWSI Project and the opportunity for independent State assessment activities give rise to a potential for impacts on communities and groups from the activities of researchers.

4. Practical considerations such as timing, complexity or simplicity, and difficulty in adhering to the regulations of the Office of Management and Budget (OMB).

A listing of five recommended components of the assessment was presented in Chapter 2. The components were (1) community well-being, (2) individual/group well-being, (3) values, (4) perceptions and attitudes toward the repository, and (5) institutional/system-level well-being. In Table 3-3, the recommended components listed in the original table are placed alongside recommended methods of data collection. Because this paper is intended to provide a general overview of an SIA plan, the elements within each component represent suggested elements only; a detailed breakdown and definition of the concepts will be the subject of further work.

3.5.2 INTEGRATION OF METHODS

The overall approach that is recommended is a multistrategy, triangulated approach. Essentially, this approach seeks to capture the multifaceted nature of social life, to balance the strengths and weaknesses of different

Table 3-3. Components, suggested elements,[a] and data collection methods of a recommended SIA approach

Components and elements	Data collection method
Community Well-Being/Vitality	
- Population characteristics;	Secondary data collection supplemented by primary data, as required.
- Economic resources;	
- Facilities/services/fiscal resources;	
- Organizational processes;	Ethnographic research, focus groups.
- Historical experience, cultural groupings leadership characteristics;	Ethnographic research, Focus groups.
- Effectiveness of political, educational; and service institutions.	Social indicators[c].
Individual/Group Well-Being	Social indicators.
- Command over goods and services;	
- Physical/mental health;	
- Sense of personal efficacy;	
- Families that function well;	
- Personal interaction and support networks.	
Values	Ethnographic research[b]
Perceptions/Attitudes Toward Repository[d]	
- Knowledge of repository/radioactive material;	Content analysis of State and local newspapers.
- Perceptions;	Ethnographic research
- Attitudes.	Focus groups. Random sample survey.
Institutional/System-Level Well-Being	
- Coordination/effectiveness;	Content analysis of State and local newspapers. Ethnographic research.
- Trust in government institutions.	Social indicators.

[a]Elements are preliminary only. They are representatives of the type of elements that may require examination.

[b]Ethnographic research includes participant observation, study of local records and newspapers, and key-informant interviews.

[c]Development and use of social indicators requires ethnographic research for values profiling, key-informant interviews for validation of quality of life components, and secondary data collection and surveys for compiling and monitoring indicators.

[d]This component is discussed in greater detail in the companion report (SAIC, 1986).

methods, and to reduce the uncertainty of the findings. The goals that have guided the particular combination/integration of methods proposed are:

1. Ability to accomplish a broad range of tasks (Cook and Reichardt, 1979).

2. Achievement of breadth (statistical representativeness) and depth.

3. Ability to reflect both objective and perceptual aspects of social life (see Fielding and Fielding, 1986).

4. Adoption of a step-by-step approach in which one method builds upon another (see Sieber, 1973; Finsterbusch and Hamilton, 1978; Cook and Reichardt, 1979).

5. Provision of continuous adjustments to the core assumptions that provide the basis of forecast accuracy (Ascher, 1978).

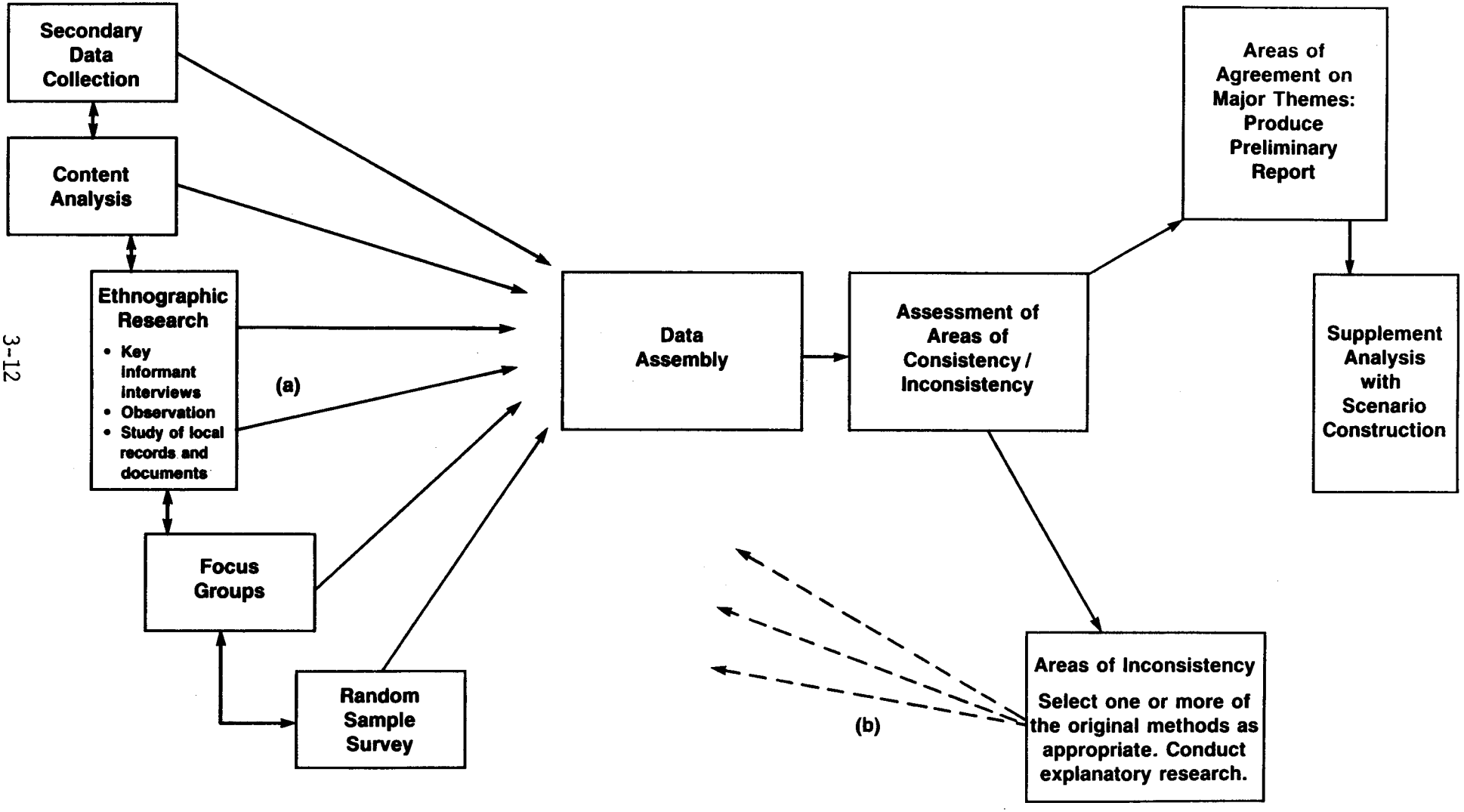
6. Involvement of local residents in planning their own future.

In place of a linear study plan, the proposed approach is an interactive one which heeds Coates' advice to those who are involved in comprehensive impact studies: "'Do the job, do the job again, and do the job a third time,' works out a lot better whatever method or technique you are using" (Coates, 1974). Thus, quantitative and qualitative methods are used iteratively throughout (see Louis, 1982a, for a discussion of the differences between sequential, parallel, fused, and interactive models for integrating theories and methods of data collection and analysis). Variation in results is treated as an additional source of data (Lever, 1981; see, however, Trend, 1978, for a discussion of problems of inconsistency that may arise).

Figure 3-2 illustrates, in simplified form, the basic concept of an interactive approach. The data collection methods, grouped on the left of the diagram, interact with each other in the sense that data acquired by one are used as input to the other. Thus, the selection and implementation of methods forms an iterative process whereby data obtained by one method (or subset of methods) may be used to augment data from other methods or to suggest further development of methods to be used.

The staggered arrangement of the methods represents the planned sequence of implementation: it constitutes a step-by-step approach designed to "pyramid evidence" into a relatively conclusive whole (Finsterbusch and Hamilton, 1978). Unobtrusive methods of secondary data collection and content analysis are implemented first to provide a broad information base in addition to needed data for indicators or information on community events. The secondary data include economic, demographic, community services, housing, and fiscal data that comprise the resource base of a community. (Actual data collection may be undertaken by other members of the socioeconomic team; the social assessment would draw directly on the data and also on the analyses provided by economists, demographers, and public service analysts.) Data from

Figure 3-2. Simplified illustration of the concept of an interactive SIA plan.



[a] Solid lines denote interaction among methods.

[b] Broken lines denote selection of methods for further research.

qualitative methods--ethnographic research (key-informant interviews/ observation) and focus groups--may be combined qualitatively with secondary data to produce a preliminary area portrait. An analysis guided by formal pattern coding (for example, identification of themes, causes/explanations, basic social processes/theoretical insights) would permit comparison across communities. These data provide a depth of understanding that is both an invaluable foundation and a continuing reference point for studies. The investigator subsequently can design his/her formal surveys based on the values and frames of reference of potentially affected persons. The preliminary profile is subsequently compared with and augmented by indicator data and attitudinal data from the survey.

The survey that is implemented both confirms and permits generalization of some features and also suggests additional avenues of study. It is two-pronged. One aspect includes subjective responses on individual and community quality-of-life items in a system of social indicators. The items are developed from residents' values, identified by ethnography, and validated in interviews with key informants. A second aspect of the survey assesses attitudes and likely behavioral response to the repository. Extension of the survey statewide and to control communities not affected by repository activities will permit a more controlled comparison. A decision on the type of survey to be adopted (mini, trend, panel, etc.) is subject to a variety of trade-off factors (see companion report, SAIC, 1986).

One of the goals of combining both qualitative and quantitative methods of data collection and analysis has been to tap both the structural and perceptual aspects of social reality, combining knowledge that is "real and deep" with knowledge that is "hard" (Zelditch, 1962). Therefore, while the analysis and forecasting of impacts draws heavily on the naturalistic tradition of depth of understanding, that understanding includes, also, the statistical analysis and prediction of change in social indicators of well-being and the attitudinal survey data. The underlying analytic process is one in which researchers build upon and cross-check findings from a variety of data sources, investigators, theories, and methods.

3.5.3 FORECASTING

It is recommended that impact analysis be supplemented by a specific forecasting tool whose primary aim is to overcome one of the problems of social forecasting that may be amenable to solution. This problem is that of appraisability. As emphasised by Ascher (1978):

> A social forecast that is so lacking in specificity that it cannot be verified is a hazardous base....Appraisability is also a quality that permits experts to choose the most suitable approaches (on the basis of their performance) to assess progress in their field and to assign confidence limits for the forecasts they are developing.

A specific recommendation made by Ascher is the use of scenarios that permit the specification of integrated sets of events or conditions to which probabilities can be attached.[2]

While scenarios, which are essentially "imaginative narratives" (Valchos, 1981), have been criticized for their lack of validity, it must also be conceded that the use of sophisticated methods in long-range forecasting is no guarantee of improved accuracy (Hogarth and Makridakis, 1981; see also Armstrong, 1985; Henshel, 1982; Lipset, 1979; and Ascher, 1978). Two potential advantages that may outweigh the disadvantage of scenarios are (1) the specification of integrated sets of events or conditions and (2) the possibility that the construction of scenarios may be undertaken in a participatory setting.

The specification of integrated sets of events or conditions results in the open display of the analyst's core assumptions. This process is valuable for two primary reasons. First, it overcomes one of the problems noted in the review of frameworks that used qualitative impact analysis techniques, i.e., that they lacked clearly specified procedures. Second, as noted by Ascher (1978), core assumptions constitute the primary determinant of forecast accuracy. Open display of the analyst's assumptions forces him or her to "put [his/her] intellectual apparatus on the line" (Collins, 1981), permits the questioning of core assumptions from a variety of viewpoints, and enhances the possibility that they will be sound.

In his review of the effectiveness of decision-making techniques, Hogarth (1977) has emphasised that there may be situations where the involvement of persons who will be responsible for implementation or acceptance of a

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[2]Many problems of social forecasting have been cited in the literature. These include the interaction of a multiplicity of variables; lack of a body of SIA research giving empirical evidence of causal relationships; dependence on past experience as a guide to the future (with an accompanying vulnerability to surprise events); the independence of social factors from material resource bases; and the problem that publication of a forecast can in itself lead to self-fulfilling or self-defeating results. Long-range social forecasting, such as is required in the NNWSI Project context, is particularly likely to be inaccurate (see, especially, Ascher, 1978; also, Soderstrom, 1981). These problems are unlikely to be solved in the near-term; indeed, some scholars espouse the view that their solution is highly unlikely, or even impossible (see, especially, Polyani, 1967, for a view of the emergent and inherently unpredictable nature of social conditions; see also, Lipset, 1979).

decision may be a more important consideration than the theoretical effectiveness of the technique itself.[3] The emphasis on participation written into the Nuclear Waste Policy Act (NWPA), combined with the inherent weakness of long-term social forecasting, suggests that the involvement of potentially affected persons in the process of deciding their own future may indeed be an avenue worthy of pursuit. This involvement would necessarily require careful attention to the literature on group processes, problems of judgment (both expert and nonexpert), and on ways of controlling these problems, in addition to an understanding of the practicalities of scenarios construction (for succinct reviews and guides to the literature, see Mumpower and Anderson, 1983; Hogarth and Makridakis, 1981; and Hogarth 1977; see, also, Armstrong, 1985; and Abt, Foster, and Rhea, 1973).

Overall, scenarios offer both a tool for improving social forecasts and an opportunity for meaningful involvement. Use of such tools may be seen as part of the trend identified by Soderstrom (1981), in which "SIA as impact projection" is moving toward "SIA as a process of impact management."

3.6 CONCLUSION

The preceding chapter has discussed and recommended a methodological approach for assessing the social impacts of repository construction and operation by the NNWSI Project. Criteria for selecting methods of data collection have been recommended for each of the five suggested SIA components presented in Chapter 2. Additionally, goals were presented as a guide toward the successful integration of selected methods into an interactive, triangulated approach in which the researcher would draw upon the strengths of the various methods to derive both statistical objectivity and perceptual understanding from the results. A discussion of three broad types of forecasting techniques was presented, and a recommendation was made for the supplementary use of scenarios as a forecasting tool with the advantages of specifying sets of events or conditions and allowing the participation of persons who have a stake in decisions being made.

In sum, this report has attempted to identify the essential components of a plan that would apply specifically to assessment of potential social impacts of repository construction and operation at Yucca Mountain. Chapter 1 provided the background discussion of SIA necessary to an understanding of social phenomena that can be affected, research problems and developments in the SIA field, and unique aspects of the NNWSI Project. Chapter 2 recommended five basic components to guide SIA, based on particular strengths and

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[3]This viewpoint is closely allied to a view of scenario construction as being normative as opposed to being purely analytical and exploratory (see Gerardin, 1973, for a related discussion; see also Martino, 1973, for a viewpoint of the value of forecasting in terms of its contribution to decision-making).

common elements of several frameworks presented, the inclusion of different social units of analsyis emphasized in the frameworks, and incorporation of potential special effects arising from repository siting issues. Finally, Chapter 3 has drawn upon the preceding two chapters to recommend methods of data collection and goals for integration of methods into an interactive, triangulated approach for assessing social impacts relevant to the proposed repository construction and operation.

APPENDIX A

SUMMARY OF SELECTED EXAMPLES OF SOCIAL IMPACT ASSESSMENTS AND GUIDELINES OF FEDERAL AGENCIES

A.1 INTRODUCTION

This appendix summarizes the author's review of the practice of social impact assessment (SIA) by Federal agencies. It includes a discussion of agency requirements and practice and an examination of recently published Environmental Impact Statements (EISs) conducted pursuant to the National Environmental Policy Act of 1969 (NEPA). The discussion of agency requirements is followed by a table that summarizes the scope and methods of selected post-1980 EISs.

The review of EISs does not claim to present a comprehensive picture of SIA work being conducted by Federal agencies. Rather, it is intended to illustrate some past examples of SIA. Comprehensiveness was limited by two major factors. First, the search for EISs was not systematic. A systematic computer-assisted search of post-1980 EISs was undertaken only for U.S. Department of Energy (DOE) publications. Constraints such as time and ease of access prevented a similar search for other Federal agencies. Second, the discussion of social effects included in the EIS may not reflect the scope and depth of the analysis because background documents to each EIS were not readily available.

An example of the latter problem can be illustrated by reference to the East Grand Forks DEIS (1984) published by the U.S. Army Corps of Engineers. While the scope of the analysis was apparent from a review of the document, there was little indication of the methods used. An examination of the background documents revealed that a variety of methods had been used. They included, in addition to secondary data, a random sample survey of area residents, structured interviews with business leaders, "futures scenarios" workshops with community leaders and government officials, and an institutional analysis that involved a telephone survey of personnel in a variety of government organizations.

A.2 WATER RESOURCES AGENCIES

The conduct of SIA, with an emphasis on public involvement, is an accepted feature of water resource planning activities. Historically, these activities have been governed by the Principles and Standards (now Principles and Guidelines) established in addition to NEPA (Federal Register, 1973; 1980; 1983).

The Principles and Guidelines provide guidance to agencies involved in Federal water resource planning. These agencies include the Corps of Engineers and the Bureau of Reclamation in the Department of the Interior. The Principles and Guidelines establish four accounts comprising categories of effects to be analyzed; integration of these requirements with NEPA requirements is emphasized. The Other Social Effects Account (OSE) lists categories of impact or topics to be addressed in the SIA process. These categories have evolved over time and are listed in Table A-1. A distinctive feature of water resource planning is the emphasis on public involvement and appraisal of impacts, which involves the assignment of social values to the technical information collected in the assessment process.

TABLE A.1 Categories of impacts or topics specified in the Other Social Effects account of the Principles and Guidelines[a]

Principals and Standards 1973	Principals and Standards 1980	Principals and Guidelines 1983
Real income distribution.	Urban and community impacts	Urban and community impacts
	Income;	Income distribution;
Life, health, and safety.	Employment;	Employment distribution;
	Population size and composition;	Population distribution and composition;
Educational, cultural, and recreational opportunities.	Fiscal condition of the State and local governments;	Fiscal condition of State and local governments;
	Quality of urban and community life.	Quality of community life.
Emergency preparedness.	Life, health, and safety.	Life, health, and safety.
Other.	Energy requirements and conservation.	Displacement.
		Long-term productivity.

[a]Federal Register (1973, 1980, 1983).

Variation exists in the interpretation, emphasis, and practice of SIA requirements both between the Corps and the Bureau of Reclamation and among the regional districts of each agency. The Bureau of Reclamation requires Public Values Assessment (PVA) to be undertaken in SIA. PVA is a multi-attribute utility analysis in which stakeholders make value judgements on a variety of factors that are used to evaluate alternative plans and that are subsequently aggregated to result in an overall desirability score for each alternative by stakeholder group.

A.3 U.S. DEPARTMENT OF AGRICULTURE (USDA), FOREST SERVICE

Guidelines and procedures for conducting social analysis of programs, resource plans, and projects in the Forest Service are published in the Forest Service Manual (FSM) Title 1900, Chapter 1970. These guidelines and procedures apply to social analyses conducted pursuant to the National Forest Management Act (NFMA) and NEPA.

Variables for analysis are to be selected from four major categories of social effects: lifestyles, attitudes, beliefs, and values; social organization (components are institutions, community cohension, and community stability); population; and land use. Variation exists among regions in specific application of the regulations. Application of the regulations for social analysis can be seen in the Final EIS for the Early Winters Alpine Winter Sports Study (USDA, 1984).

A.4 U.S. DEPARTMENT OF THE INTERIOR (DOI)

The Bureau of Land Management (BLM) in the Department of the Interior has been responsible for application of the Group Ecology Model (discussed in Chapter 2 of this report) in the EIS for the Mobile Oil Shale and Pacific Oil Shale Projects in Colorado (DOI, 1984b) and sponsorship of the development of A Guide to Social Assessment in 1982. The guide also appears as a publication by Westview Press (Branch et al., 1984); although it is not required for BLM staff, it has been applied in the Powder River Coal DEIS (DOI, 1984c). In addition, the Minerals and Management Service has sponsored a technical report entitled A Social Indicators System for OCS Impact Monitoring. The report, which was published in December, 1985 was written by Stephen Braund, John Kruse, and Frank Andrews and is intended for projecting and monitoring changes in the individual well-being of Alaska residents who may be affected by development activities on the Alaska Outer Continental Shelf.

A.5 U.S. NUCLEAR REGULATORY COMMISSION (NRC)

SIAs were not included in the 20 EIS documents published by NRC that were examined for this report. However, the NRC has commissioned a variety of relevant studies. Studies undertaken by Oak Ridge National Laboratory (ORNL) for the NRC examined the actual social and economic effects of nuclear power plants prior to the accident at Three Mile Island (Purdy et al., 1977; and Shields et al., 1979); an additional series of retrospective studies examined

the socioeconomic (including social) effects of nuclear power plants (Chalmers et al., 1982). The NRC also sponsored and published a report on the Workshop on Psychological Stress associated with the TMI restart issue (Walker et al., 1982).

A.6 U.S. DEPARTMENT OF ENERGY (DOE)

Relevant studies that have been sponsored by DOE include (1) a discussion of incentives and nuclear waste siting (Carnes et al., 1983), (2) an examination of the social and psychological impacts of the Three Mile Island (TMI) restart issue (Sorensen et al., 1983), and (3) a study of the attitudes of community leaders in a proposed nuclear host community (Bronfman, 1977). A computer-assisted search of all post-1980 EISs published by DOE revealed only a cursory mention of potential social effects in most documents. The West Valley EIS (DOE/EIS 0081, 1982c), the Waste Isolation Pilot Plant (WIPP) EIS (DOE/EIS 0026, 1980), and the Garrison-Spokane 500-KV Transmission Project EIS (DOE/EIS-0091, 1982b) were exceptions. (The Defense Waste Processing Facility EIS (DOE/EIS-0082, 1982a) assessed attitudes of local community residents toward the plant.)

The West Valley EIS specifically included a discussion of the potential for "some indirect socioeconomic impacts (such as fear and changes in governmental and social relationships) associated with public perceptions of radiological risks and the inequitable distribution of such risks." The discussion was descriptive rather than predictive. It should be noted that this EIS was being prepared during the Supreme Court's review of the decision regarding the need to examine the potential for harm to the psychological health and community well-being of residents of the surrounding area in the event of a TMI unit 1 restart. (The Supreme Court overturned the judgment of the lower court. See Metropolitan Edison Co. v. Pane, 1983.)

The WIPP analysis included an examination of potential social impacts. The potential for social structure impacts resulting from the distribution and composition of the inmigrating workforce and the distribution of economic effects among population groups were specifically noted (none were expected). Attitudes and perceptions of the proposed facility were discussed in detail: both special (i.e., related to perceptions of radioactive waste) and standard (i.e., related to community growth issues) aspects of the facility were considered. Unstructured key informant interviews and qualitative analysis were used.

The Garrison-Spokane EIS was published by the Bonneville Power Administration. Standard social effects of the impact of the construction workforce on local communities were not expected. The social analysis noted, specifically, the alienation among local residents that resulted from concern and uncertainty over potential negative effects (visual, aesthetic, inconvenience, health, and property effects). A lengthy appendix detailed the social impacts that were "associated with personal perceptions and values rather than with objective social indicators such as rates of crime and divorce." Data collection methods included unstructured and structured interviews (the sample was not a statistically random sample). Analysis was based on

descriptive statistics. The Group Ecology Model (GEM) with its emphasis on functional groups and distributive impacts, appears to have been used.

A.7 SUMMARY OF EIS REIVEW

Table A-2 summarizes the review of selected post-1980 EISs that included SIA. Items noted are (1) variables or categories of social impact examined, (2) social impacts identified or considered, (3) methods of data collection, (4) methods of analysis, and (5) theoretical framework.

Table A-2. Summary of review of selected, post-1980 Environmental Impact Statements

Agency	(D)EIS	Variables/categories of impact examined	Social impacts identified/considered	Methods of data collection	Methods of analysis	Framework
Department of Energy	Waste Isolation Pilot Plant (WIPP), Final Environmental Impact Statement, 1980.	Scenic, historic, and cultural resources. Social characteristics - Employment structure and unions Earnings, occupation, poverty, union representation and membership; - Sociocultural conditions/attitudes toward: Valued/disvalued community attributes, Attachment to community, Political efficacy, Elected officials' representation of constituency, Current land-use patterns, - Churches and community organizations; - Social Services; - Community planning capabilities	Social structure - Effect on social and cultural institutions Compatibility of immigrants with residents/potential for social conflict; - Sociocultural impacts attitudes/perceptions Local knowledge about WIPP Project, Primary benefits and problems associated with WIPP, Distribution of impacts among area residents, Impacts on recreation and tourism, Community change, Safety concerns, Attitudes toward construction and operation workers; - Labor unions; - Social services; - Churches and other community organizations.	Secondary data collection. Unstructured discussions - Key informant interviews; - Systematic random sample of area residents, drawn from local telephone listings.	Qualitative.	Not stated.
	Long-Term Management of Liquid High-Level Radioactive Wastes Stored at the Western New York Nuclear Service Center, West Valley, Final Environmental Impact Statement, 1982.	Not stated.	Indirect impacts resulting from public perceptions of risk and effects of radioactivity - Impacts on local real estate market, local tourism and recreation, and during an emergency; - Fear and changes in social and government relationships. Equity and distribution of risks.	Not stated.	Not stated.	Not stated.

Table A-2. Summary of review of selected, post-1980 Environmental Impact Statements (continued)

Agency	(D)EIS	Variables/categories of impact examined	Social impacts identified/considered	Methods of data collection	Methods of analysis	Framework
Department of Energy (continued)	Garrison-Spokane 500-KV Transmission Project, Draft Environmental Impact Statement, 1982.	Perceptions, values, attitudes and concerns of local groups toward: - Local community and environment; - Proposed project: Knowledge about proposed construction, Perception of need for additional transmission lines, Expectations of effects from lines' construction, Location of the transmission lines, Anticipated response to transmission line routing.	Social effects associated with personal perceptions and values - Number of people affected by: Concern/uncertainty about negotiations on right-of-way agreements Dealings with construction/maintenance crews, Daily exposure to physical presence of line, Disruption of agricultural practices, constraint of land use options, and provocation of concerns over long-term effects on health, safety, and land values; - Alienation effects; - Special considerations related to land use and political issues.	Interviews (purposive sampling) - Formal, structured, open-ended interviews; - Informal, corroborative interviews. Secondary data collection - Reports of public involvement meetings; - Local newspapers; - Letters to the agency; - Economic and demographic data.	Qualitative.	Not stated. Appears to be Social Organization Model.
	Defense Waste Processing Facility, Aiken, S.C, Final Environmental Impact Statement, 1982.	Community attitudes - Toward nuclear facilities; - Community relationships with the Savannah River Plant.	Not stated.	Key informant interviews, primarily with elected and appointed officials and business representatives.	Qualitative.	Not stated.
Department of Interior	Mobil-Pacific Oil Shale, Final Environmental Impact Statement, 1984.	Long term and recent historical influences on the social structure. Socioculture groups - Group profiles; - Intra- and intergroup social, economic, and political interaction patterns.	Changes in social structure - Changes in group composition and size; - Changes in intra- and intergroup social, economic, and political interaction patterns.	Not stated (typically, Group Ecology Model relies on key informant interviews).	Qualitative: Supplemented by modified delphi process for evaluation/ranking of alternatives	Group Ecology Model

Table A-2. Summary of review of selected, post-1980 Environmental Impact Statements (continued)

Agency	(D)EIS	Variables/categories of impact examined	Social impacts identified/considered	Methods of data collection	Methods of analysis	Framework
Department of Interior (continued)	Powder River, Draft Environmental Impact Statement, 1984.	Characteristics of potentially affected communities and American Indian Tribes - Population size and change; - Labor force; - Facilities and services; - Local regulations; - Leadership experience; - Attitudes toward development; - Economic, social, and political diversity; - Linkage to nonlocal organizations; - Coordination; - Patterns of interaction.	Differential community impacts, depending on community's ability to absorb rapid population growth. Communities with little prior exposure to industrialisation, little experience in dealing with growth management issues or external agencies, and a limited facilities and services base would experience short and/or long term effects from changes in population size and composition - Chaotic conditions in housing and community services; - Changes in virtually every aspect of community life; - Increased diversity, urbane environment; - Decreased social integration/changes in interpersonal relations: increased transience, segmentation, impersonalisation, and bureaucracy; - Community instability; - Group conflict; - Stress on long-term residents, especially elderly; - Increased personal difficulties and personal, disruptive behavior; - Differential ability to capture revenue benefits generated. Effect on American Indian reservations - Cultural incompatibility; - Deterioration in existing administrative capabilities, social problems and service provisions; - Cultural deterioration; - Inability to capture potential employment and revenue benefits generated, without special provisions.	Not stated (Social organisation Model was used).	Qualitative.	Social Oranization Model.

Table A-2. Summary of review of selected, post-1980 Environmental Impact Statements (continued)

Agency	(D)EIS	Variables/categories of impact examined	Social impacts identified/considered	Methods of data collection	Methods of analysis	Framework
Department of Interior (continued)	Kremmling Resource Area, Resource Management Plan/Final Environmental Impact Statement, 1984.	Characteristics of potentially affected communities - History; - Geographic location; - Population; - Economic base; - Occupational characteristics; - Cultural/ethnic groups. Social attitudes and intergroup relations - Attitudes, values; - Intergroup relations: Social stratification, Social controls, Social cohesion, group solodarity, Social conflict, Regional economic and social, integration. Formal social structures and services - Form of government; - Service provisions; - Indicators of social problems; - Cultural and recreational opportunities. Voluntary Associations - Formal and informal groups.	Distributional effects - Group attitudes toward alternative plans; - Winners/losers. Futures foregone - Present vs future needs. Social impacts resulting from population growth, demographic shifts, and cultural diversification - Social integration/intergroup relations; - Increased local employment opportunities, improved facilities, and changes in community service needs; - Social structural differentiation, group conflict, changes in distribution of power; - Temporary social problems.	Observation. Available secondary data collection. Informal interviews with a "handful" of community leaders.	Qualitative.	Not stated: Appears to be a modified form of Group Ecology Model.
Department of Agriculture, Forest Service	Early Winters Alpine Winter Sports Study, Wasama, WA., Final Environmental Impact Statement, 1984.	Sociocultural groups - Group profiles; - Intra- and Intergroup social, economic, and political interaction patterns.	Changes in social structure - Changes in group compositions and size; - Changes in intra- and intergroup social, economic, and political interaction patterns.	Not stated (typically, Group Ecology model relies on key informant interviews).	Qualitative.	Group Ecology Model.

Table A-2. Summary of review of selected, post-1980 Environmental Impact Statements (continued)

Agency	(D)EIS	Variables/categories of impact examined	Social impacts identified/considered	Methods of data collection	Methods of analysis	Framework
U.S. Army Corps of Engineers	Red and Red Lake Rivers at East Grand Forks, Draft Environmental Impact Statement, 1984.*	Social system - Area and population characteristics; - Residential and commercial development; - City's role in the region. Attitudes - Extent to which flooding is considered a problem; - Toward alternative plans. Social cohesion. - Choices faced in planning for the future. Institutional possibilities for implementing city flood control measures.	Temporary disruption, change, or termination of neighborhoods. Radical disruption of downtown district could provide motivation for improved shopping and service area which would establish city's retailing independence. Removal of flood threat; property values, tax base and community appearance would be enhanced by removal of flood plain restrictions. Social cohesion may be temporarily disrupted by controversy over need, community viability and equity issues.	Secondary data collection. Random sample of area residents. "Futures scenarios" workshops with community leaders and government officials. Telephone survey of personnel in a variety of government organizations.	Combination of quantitative analysis of survey data (descriptive statistics) and qualitative analysis.	Consistency with Other Social Effects of Account of Principles and Guidelines.

*Background documents or appendices were reviewed in addition to the (D)EIS.

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