**Pacific Northwest Energy Related
Regional Assessment Program**

**A Program Plan for Performing
Social Impact Assessment:
A Case Study of Coal Development
in the Powder River Region**

June 1976

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A PROGRAM PLAN FOR PERFORMING
SOCIAL IMPACT ASSESSMENT:
A CASE STUDY OF COAL DEVELOPMENT
IN THE POWDER RIVER REGION

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June 1976

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EXECUTIVE SUMMARY

A program plan is a detailed outline of the steps necessary to achieve a particular task or objective, and the sequence of those steps. A program plan for conducting a social impact assessment for the Powder River Basin has been developed to provide guidelines for a comprehensive document; one that identifies the impacts as they are perceived by the affected communities and indicates how such information may best be used to manage adverse impacts. We have attempted to give a comprehensive overview of existing studies and resources, descriptions of the potential methodologies that may be used in carrying out the impact assessment and in developing management strategies. Also, we briefly outlined the steps that should be included in the social impact assessment process. This outline and a flow diagram of the steps are a concise description of the suggested program plan.

SOCIAL IMPACT PROCESS OUTLINE

1. Identify and analyze development scenarios (those provided by developer or relevant agency), extracting necessary information.
 - a. Timing and location of development.
 - b. Extent of development--extraction, transportation processing.
 - c. Labor force projections.
 - d. Summary of environmental effects and requirements (especially land use and water).
2.
 - a. Identify and select multiplier for making population projections. (NGPRP scenarios and multipliers; HUD handbook on Rapid Growth also describes suggested multipliers, as do some environmental impact studies in their labor force projections.)
 - b. Make population projections, including information about local labor market for resource development as well as secondary and tertiary employment; labor force profiles.
3. Develop lifestyle profile of major groups in the affected region/communities. Utilize existing studies as much as possible in

Powder River region. Use indigenous staff for interviewing and to review interpretations or analyze findings. Particular need to obtain information on Native Americans in the region. May use two survey methodologies--ethnographic and survey research; both random sampling and sociological sampling techniques. If new surveys are taken, they should be preceded by an information program to familiarize respondents with the implications of development.

4. Develop comprehensive list of social dimensions that may be affected by resource development.
 - a. Utilize information from cultural lifestyle profiles to select those dimensions that are highly valued (of high priority) to residents of the area as a whole and to separate groups in the area (note especially differences between groups).
 - b. Delete those dimensions not relevant to the area under study.
 - c. Select indicators for the remaining dimensions (use those for which information is available as much as possible).
5. Measure current conditions of social dimensions/indicators.
6. Identify projected impacts on these social dimensions/indicators.
7. Analyze the list of projected impacts to determine how they relate to each other and how they relate to the projected environmental impacts. (This work is being undertaken currently in the Regional Assessment Program at Battelle, Pacific Northwest Division, and in other ERDA laboratories.)
8. From Items 5 and 6, ascertain gaps in existing facilities and services capabilities for providing for projected needs.
9. Identify current tools/capabilities for managing impacts.
 - a. Planning/governmental structure.
 - b. Financial resources--tax base, governmental assistance.
10. Identify resources outside of community that may be used to fill gaps in impact management capability of community/region.
11. Ascertain how such tools/strategies fit in with governmental/planning structure and values of community.

SOCIAL IMPACT ASSESSMENT PROGRAM PLAN DIAGRAM

SOCIAL IMPACT MANAGEMENT PROGRAM PLAN DIAGRAM

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INTRODUCTION

This report presents a program plan for assessing the social impacts resulting from coal development activities in the Powder River region of Montana and Wyoming. The assessment of social impacts is an area of research and planning still subject to many different approaches and interpretations. Traditionally, the social impact assessment process has been confined to identifying and measuring the projected impacts of large projects on community services and facilities. The resulting assessments have described existing conditions of selected community factors, and projected changes in demands on these factors caused by the development under consideration. Such work provides valuable information on deficiencies in community facilities and services that will occur given certain levels of development; this defines the projected needs of the impacted community. However, identification and impact measurement are not the only steps needed in the social impact assessment process if it is to be useful to the government agencies and local governments that must plan for and deal with social impacts.

The research team feels that there are two additional components in the comprehensive social impact assessment process. First, a value framework is involved, used either implicitly or explicitly, to determine 1) which dimensions or aspects of community life should be monitored for potential impacts or changes, 2) which impacts are adverse, and 3) how to deal with such impacts. Usually the values upon which these decisions are made are those of the researcher. We believe that, as much as possible, the values of the impacted community and region should be the basis for such decisions. Thus, the first additional component and an initial step in any social impact assessment is constructing a lifestyle profile of the major groups in the affected area as a value framework for the selection and interpretation of factors to be monitored for impacts.

A second additional component that should be included in the social impact assessment process is the identification and analysis of available means to prevent or ameliorate adverse social impacts. This additional step

requires integrating the measures of social impacts, to provide a framework for planning and acting to prevent or mitigate these impacts.

To date several socioeconomic impact studies and community attitude surveys have been undertaken in the coal development areas of Wyoming and Montana. Generally, these studies provide a comprehensive view of existing conditions, the values of at least some of the major groups, and projected impacts that various levels of coal development will have on affected community and regional lifestyles. However, the information from these studies has not been integrated explicitly so that community or cultural group values are reflected in the choice of dimensions or in the interpretation of various social impacts. Nor has this information been utilized to identify specific alternative means for preventing or mitigating these potential impacts. The purpose of this study is to capitalize on information in these existing studies, and then integrate their more limited approaches into the comprehensive social impact assessment and management process described earlier.

Specifically, the study's objectives are:

1. To describe methods for identifying and characterizing lifestyle profiles of the major cultural groups in the region being studied, based on a review of existing studies.
2. To identify all relevant dimensions of social impact assessment in the Powder River region, based upon the cultural values of the region.
3. To develop methods for integrating social impact assessment data into a framework for managing such impacts.
4. To incorporate the information gained in Items 1, 2, and 3 into a concise program plan, for use by developers and agencies involved in social impact assessment studies in the region.

This program plan reflects the common methodologies used in social impact assessment and the major issues of development specific to the region. The program plan does not identify a separate methodology for each potential technology and various levels of development; the methods for determining

social impacts in this region do not vary with specific technologies and levels of activity, though the actual social impacts will of course differ. Thus there is no separate discussion of the different types and levels of impacts resulting from development alternatives (such as transport of coal by unit train or by slurry pipeline; mine-mouth conversion through gasification, liquefaction or in coal-fired power plants; and export of raw coal out of the region for conversion elsewhere).

I. PROJECTIONS OF RESOURCE DEVELOPMENT IN THE POWDER RIVER REGION

Central to an examination of social impacts is the projection of the types of changes that may occur in individual actions and in social structure and functioning as the result of a technological innovation. To begin this process the researcher identifies scenarios or situations that may create the changes. In the studies of the Powder River region these scenarios center on coal development; they differ in their assumptions of development intensity (e.g., low-medium-high levels of development) and types of technology used. Once the basic scenarios have been defined, the conditions and trends existing in the region must be identified and projections made of population and employment changes. Changes in these two sectors are then used to estimate other social impacts--changes in demand for community services, changes in community structure and functions, and changes in the social characteristics of individuals in the affected communities.

Several basic phases of the coal development process, depending on how they are carried out, can have significant implications for the nature and extent of changes in the social structure and community life of the Powder River region. These phases include:

Extraction of the raw coal, which means surface or strip mining in the Powder River region.

Transport of the coal to its conversion point. Transport of coal is usually accomplished through unit train or slurry pipeline. Unit trains are entire trains that carry only coal; slurry pipelines transport pulverized coal suspended in water. Pumping stations, dewatering facilities and, in some cases, storage facilities are also required for pipelines. Mine-mouth conversion, where the coal is converted to fuel at a plant at the mouth of the mine, involves only truck transport for very short distances.

Utilization of the coal. Coal can be processed and converted into electricity or natural gas at the site of extraction, at another plant in the region, or the coal can be exported to other states and regions. There are

several techniques for conversion including gasification, liquefaction and the use of coal in traditional coal-fired power plants.

As pressure to develop the coal resources in the Northern Great Plains has increased, several comprehensive studies and projects have been undertaken to identify the probable course of development and the types of changes that may result. The Northern Great Plains Resources Program (NGPRP) is a research group established to provide "information for use by decision makers concerning potential coal development and associated impacts" (NGPRP, June 1974, p. ix). Individual state agencies responsible for economic and community development have also developed scenarios, occasionally in conjunction with NGPRP, and sometimes based on their own assumptions. We will not describe in detail the specific scenarios nor will we analyze their accuracy, but we will discuss the major elements which seem to be intrinsic to the construction of scenarios or alternatives.

The scenarios for the Northern Great Plains, which includes the Powder River region, differ basically in assumptions of level and intensity of development. They list the timing, numbers, location and types of the mines and coal processing facilities expected for each level of development. They also project employment figures (both permanent employees, and construction employees in the region only for the length of the construction project) for each of the development levels. The scenarios are meant to be a framework for analyzing the social, economic and cultural impacts of various levels of development. (They are also used as a framework for assessing environmental and other physical impacts, but that is outside the purview of this study.)

For a social impact assessment to be made of coal development in the Powder River region, the following baseline information will be necessary:

1. The basic resource to be developed and the level of development of this resource (several alternatives can be suggested here).
2. Other resource requirements for development, especially:
 - a. Land--amounts needed for mining, rights of way for pipelines, transmission lines, present uses of the land.

- b. Water--amounts needed for mining and processing activities; present uses of water for agriculture, municipal water supplies; owners of the water rights, etc.
3. Employment requirements for the several alternative rates of development and types of technologies used (direct and secondary employment requirements).
4. Transportation requirements of the development process including identification of market locations and alternative transportation modes to be used.

As mentioned earlier, this information is available from the existing social impact studies of the Powder River region that have been undertaken in recent years although there still is much controversy surrounding specific population and employment projections. These studies base their projections on similar models of the ratio of basic employment to secondary employment although their alternative development scenarios are often based on different assumptions about levels of development. However, such differences among the assumptions and perceived inadequacies generally are identified very clearly, and researchers and others using the projections have tended to insert qualifiers if they have disagreed with the method used.

Another source of this baseline information is and will be the environmental impact statements filed by the various federal agencies approving or licensing coal development activities in the Powder River region. This information is the basis for projecting overall population increases and the effects of such increases on community services and facilities.

A caution which should be mentioned is that social impacts are closely related to, and interwoven with, all other types of impacts resulting from coal development. Impact assessment must become a more interdisciplinary endeavor than it has been in the past, and social impact researchers must learn to converse with legal experts, air quality experts, soil experts, etc. Some environmental variables which have particular relevance to the types of social impacts occurring and expected in the Powder River region include:

1. Water rights and availability. To the ranchers and Native Americans in the Powder River region, water is a precious commodity in their semi-arid environment and a necessity to their existing way of life. Farmers and ranchers must be assured of its continued availability, to plan and feel confident of their lifestyles. The problem of conflicting uses of water should be addressed under social impact assessment since the ramifications of certain solutions to the water problem include social impacts for the residents of the region. Such social impacts might include the loss of livelihood for some residents, a change in the agricultural economic base, and a change in the types of jobs available.
2. Surface land requirements. Strip mining unavoidably damages the soil, at least temporarily. In an agricultural economy this is significant; potential reclamation becomes very important. This is a particularly controversial issue in the Powder River region since there has been little experience with reclamation of arid lands.

II. DIMENSIONS OF SOCIAL IMPACT ASSESSMENT

A. OBJECTIVE DIMENSIONS

Determining how population and economic changes will affect the social structure and community life is a basic function of social impact assessment. Traditionally most social impact assessments have examined sets of variables or dimensions assumed to be most relevant for assessing the kinds of impacts a community can expect. The studies have measured the existing state of the selected dimensions, and then estimated the effects that the projected population and economic changes identified in alternative scenarios will have on these dimensions. Several extensive social impact assessments for the Powder River region have identified important variables and collected data. Most are several years old and the data used now need updating; however, these impact assessments should be used extensively to complement any new social impact assessment of the area.

A well known example of these existing reports is the Socio-Economic and Cultural Aspects Work Group Report of the Northern Great Plains Resources Program. This report is a summary of some of the 20 reports which were commissioned by NGPRP. Table 1 (columns 1-5) presents the social dimensions considered important by some of those 20 reports and several other studies which were not part of the NGPRP. (For purposes of comparison the objective dimensions from a recently developed Battelle social impact model are included. See Section II.D. for a more complete discussion of this model.)

Some of the reports had more specific mandates than others and were not expected to investigate the entire spectrum of social impacts. (See Appendix A for a more complete listing of the reports dealing with the Powder River region and adjacent areas.) The methodologies used for the reports summarized in Table 1 are described briefly below:

Anticipated Effects of Major Coal Development on Public Services:
Costs and Revenues in Six Selected Counties (Bureau of Reclamation
and Institute of Applied Research, 1975).

This report projects the impacts of large-scale coal development on future public service needs and future government revenues in

TABLE 1. List of Objective Dimensions: Existing Studies and Battelle Model

Anticipated Effects of Major Coal Development on Public Services: Costs and Revenues in Six Selected Counties	Energy Resources Development in Wyoming's Powder River Basin: An Assessment of Potential Social and Economic Impacts	Social Impact Analysis of Campbell County Wyoming	A Comparative Study of the Impact of Coal Development	Northern Great Plains Socio-Economic and Cultural Aspects Work Group Report (Summary of Other Reports)	Social Impact Assessment Model Using Quality of Social Life Indicators
Health Care Hospitals Ambulance Service Retirement and Nursing Home Public Health Nursing Mental Health Care Services Industrial Nursing Social Services County Welfare Special Services Fire Protection Law Enforcement Services Public Transportation Highways Roads Streets Municipal Services Water Sewer Garbage Collection Schools Recreation Facilities Planning Report Also Estimates Sources of Revenues	Median Family Income Per Capita Income Unemployment Industrial Earnings Skills Migration Market and Trade Patterns Population and Employment Protection	Demographic Profile Population Rate of Growth Migration Age Education Employment Profile Unemployment Rate High Incomes Housing Density Price Owned/Rented Mobile Homes Community Services Basic Water/Sewer/Garbage Medical Schools Recreation Police Public Assistance Day Training Centers Postal Population and Employment Projections	Vital Statistics Birth Rate Death Rate Welfare Data Arrest Data Mental Health Data	Effects on The Social Order Individual Family Groups and Subculture Rural Society Shifts in Power Structure Attitudes Effects on Indians Effects on Governments Sources of Local Revenue Sources of State Revenue Service Requirements and Needs local planning streamlining government health care welfare services education fire protection law enforcement highways and roads public transportation municipal services recreational facilities costs of services Development Regulations and Policies land use planning zoning Mineral leasing water environmental standards indemnification for water loss and air pollution Legislation Federal Aid Planning and Coordination Existing Need for Services Ability to Expand	Demography Population Size Amount of Population Change Rate of Population Change Population Density Age Distribution Sex Ratio Ethnic Composition Family size Economy Job Opportunities Job Distribution Gross County Income Gross County Income Change Employment Level Disadvantaged Person in Labor Force Property Tax Base Financial Inflow From Federal Government Price Level Public Revenues Availability of Retail Services Social Structure Educational Attainment Socio-economic Status Housing Availability Housing Space Residential Stability Housing Type Housing Cost Mass Media Coverage Interest Association Involvement Political Participation Local Government Capabilities Public Services Public Education Medical Care Public Health Fire Protection Public Transportation Legal Services Social Services Public Facilities Cultural Facilities Recreational Facilities Social Well-Being Lack of Crime and Delinquency Lack of Alcohol and Drug Abuse Lack of Physical and Mental Illness Lack of Racial or Sexual Disparity Lack of Family Disruption Lack of Educational Difficulties Lack of Employment Difficulties Lack of Poverty Lack of Substandard Housing Lack of Environmental Degradation

the impacted areas. It also contains "suggestions for structural reorganization of both local government and local service agencies to facilitate their ability to handle problems of the magnitude expected" (p. 1). Two counties in each of Wyoming, Montana and North Dakota were studied--counties which are among those expected to experience heaviest development pressure. Two Indian reservations (Crow and Northern Cheyenne) were also analyzed. Most of the data were obtained through interviews with service providers, public officials and citizens concerning their views of existing services and future needs. The future population estimates used in the study were from the development scenarios of the NGPRP. "Data supplied by these studies were refined as necessary to provide a more detailed breakdown of population characteristics as they relate to anticipated future service needs" (p. 7).

Energy Resources Development in Wyoming's Powder River Basin:
An Assessment of Potential Social and Economic Impacts (Matson and Studer, 1974)

This report translated the three official scenarios of NGPRP^(a) into population projections for use by analysts responsible for other investigations. The authors also analyzed some of the direct implications of their population projections. The study based population projections on increasing employment, and estimated the increasing employment levels based on the three development scenarios established by NGPRP. They used a fourth scenario (relatively rapid but sustained growth) to accommodate data from Wyoming's Department of Economic Planning and Development.

This study identified the different levels of population growth expected to occur in Wyoming's Powder River Basin counties, depending on the type of development expected in each county. Four areas were identified needing more research "to realistically evaluate the impact of energy development in the Powder River Basin: 1) the effects of population growth with respect to housing and public facilities 2) the source of labor 3) income levels and 4) settlement patterns" (p. vii).

-
- (a) The three development scenarios established by NGPRP are: a minimal coal development situation; an intermediate situation of rapid growth followed by a slower rate of growth; and a situation of very extensive coal development where coal dominates the economy.

Social Impact Analysis of Campbell County, Wyoming (Blevins, Thompson, Ellis, 1974)

This study combined "objective" assessment with attitude surveys and personal interviews to elicit attitudes toward services available and future growth accompanying extensive resource development in Campbell County. The major data sources consisted of observation, existing records and statistics, personal interviews and mail questionnaires. The secondary data sources (primarily state publications and 1970 Census of Population and Housing) were used to generate the demographic profile. Observational techniques and personal interviews were used to obtain an overview and "first-hand" picture of the county. A random survey was used to assess attitudes of the residents toward some of the changes occurring as a result of coal development.

A Comparative Case Study of the Impact of Coal Development on the Way of Life of People in the Coal Areas of Eastern Montana and Northeastern Wyoming: Final Report (Gold, 1974)

This study, although primarily of lifestyle profiles, does discuss some objective dimensions or "pertinent social variables" which are statistical data. These data, gathered from social service agencies in Montana, Wyoming and North Dakota, are laid out in tabular form for comparison. The data selected for inclusion represent variables which measure social pathology and social well-being.

Northern Great Plains Resources Program: Socio-Economic and Cultural Aspects Work Group Report (1974)

This report, as mentioned earlier, is a survey and summary of some of the 20 separate studies commissioned by the work group investigating socioeconomic and cultural variables. Thus, there is no separate methodology for this study, since it merely summarizes all the dimensions used in the other studies.

B. DATA SOURCES AND AVAILABILITY

Statistical data sources are crucial to any thorough identification and analysis of objective dimensions of social impacts. While this discussion and the program plan cannot reference a specific data source for each dimension or indicator, a general overview of the types of sources available can

be presented. All of the studies mentioned in the previous section provide some data, as well as some information about the kinds of reports and data sources available in Montana and Wyoming. Some updating of the data may be necessary, but because of the existence of several extensive studies there is no need to initiate new data collection. In addition to data sources used in the studies completed to date, researchers in the region should have access to the United States Census data--particularly the Census of Population and Housing, and the City and County Handbook. There are also several sources which provide information on state publications and their contents. These are listed in Appendix A.

Individual communities may also have their own data sources which could provide useful information for the social impact assessments.

C. LIFESTYLE PROFILE

1. Existing Studies and Dimensions

Information about the current and preferred lifestyle values of the major population groups in a region is essential to developing a framework for social impact assessment, as well as to carrying out the assessment and developing management or mitigation plans. While the social dimensions themselves are objective measures of existing conditions and of projected changes in those conditions, the selection, interpretation and use of those dimensions is based upon subjective judgments about what the important components of social life are in a community or region. The lifestyle profile can provide this useful information, thus assuring that the social impact assessment will be relevant and sensitive to the values and lifestyle preferences of the people in the affected communities and region.

Several major attitude surveys and ethnographic studies have been conducted in the Powder River region, in an effort to describe the values and attitudes of area residents toward their current way of life and the expected impact of coal development on that way of life. While studying different communities and using different research methodologies, their focus primarily is on the crucial issues and the relevant population groups in the area. Table 2 lists these reports and their conclusions.

TABLE 2. List of Value Dimensions: Existing Studies

Values	A Comparative Case Study of the Impact of Coal Development on the Way of Life of People in the Coal Areas of Eastern Montana and Northeastern Wyoming	A Study of Social Impact of Coal Development in the Decker-Birney-Ashland Area	Satisfaction, Coal Development, and Land-Use Planning: A Report of Attitudes Held by Residents of the Decker-Birney-Study Area	Social Impact Analysis of Campbell County, Wyoming
Individual	Independence, absence of regimentation, privacy, isolation	Individualism; lack of controls on people		
Family	Family centered way of life			
Community	Small town culture; sense of community	Preservation of tribal culture; ranching lifestyle; small town way of life; neighboring patterns and closeness; prefer slow growth and change	Attachment to area greatest among young, women, single, divorced and separated.	Prefer single family homes and private space; satisfied with existing services except medical
Environment	Ties to and reverence for the land (especially Montana ranchers) concern about environmental damage	Responsibility to help preserve agricultural use of land		Concern about environmental damage; manual occupations more conservationists than non-manual
Coal Development		Ranchers against all except export option; townspeople not opposed, but not enthusiastic	Young, women, single, divorced and separated sees development issues and need for planning more than others. Number of years residence, occupation, family income strong indicators of positive attitude toward development (positive correlation)	Majority oppose strip mining actually proceeding. Need for strict reclamation controls
Study Area	Montana: Big Horn, Powder River, Rosebud Counties Wyoming: Campbell, Johnson, Converse Counties	Montana: Powder River County	Montana: Big Horn, Powder River, Rosebud Counties	Wyoming: Campbell County

A significant drawback of these studies is the absence of any thorough treatment or involvement of the significant Native American population in the Powder River region. According to the author of one study (Gold, 1974, p. 2), efforts were made to include the two Indian reservations in the study. However, studies by the Northern Cheyennes and Crows were already underway, and it was hoped that opportunities to work with data from those studies would materialize. This did not occur although arrangements were made to "generate some social impact data on and around the Cheyenne reservation" (p. 2). While a few Native Americans were contacted in these studies, there is little reference to the specific values and reactions of these groups. The need and methodology for including this important segment of the population and cultures is treated at the end of this section.

A Comparative Case Study of the Impact of Coal Development on
the Way of Life of People in the Coal Areas of Eastern Montana
and Northeastern Wyoming: Final Report (Gold, 1974)

This study identifies and analyzes residents' views and reactions toward coal development, focusing specifically on landowners and townspeople in the area. Ethnographic research methods were used to obtain findings that reflect the points of view of the subjects. Using this methodology, the researcher established close continuing contact with those being studied, in order to minimize the tendency to view subjects through the researchers' own lifestyle values. A statistical (random) sample formed the basis for the initial interviews; further subjects were identified by these original respondents (sociological sampling approach) as community leaders and representatives of various groups and views in the community. In addition, the researchers sought out persons in some categories not identified by respondents (e.g., public health personnel). In total, three hundred intensive interviews were conducted in five study areas of the coal development region. This approach avoids the use of statistical analysis of human behavior, but rather reports respondents' perceptions of what impending development means to them. Here, as in all of the attitude studies reviewed, it is apparent that the issues of environmental impacts and social impacts are inextricably interrelated; it is not possible to clearly distinguish between the two. Because the economy, occupations and lifestyles are tied to and defined by the land, environmental changes greatly affect the maintenance of current lifestyles. Table 2 lists the values respondents defined as important and perceived as threatened by coal development.

A Study of Social Impact of Coal Development in the Decker-Birney-Ashland Area (Community Service Program, 1975)

This analysis is based upon a subset of data from the Gold study, focusing particularly on three of the study areas. The researchers identify the basic concerns articulated by residents of these areas, basing their findings on the original data from the ethnographic study. This study thus utilized the same methodology to obtain its findings; the values and concerns listed in Table 2 are similar to those for the larger study.

Satisfaction, Coal Development and Land Use Planning: A Report of Attitudes Held by Residents of the Decker-Birney Study Area (Jobes and Parsons, 1975)

The purpose of this extensive study was to identify attitudinal predictions and to describe environmental orientations of residents of three counties (Big Horn, Powder River and Rosebud) affected by coal development. The basic questions asked were whether people react to coal development situations according to some pattern or type of response, how any such patterns differ and what kinds of people are associated with each type. No statistical sampling was necessary in this study since it attempted to include the entire population. Eighty-seven percent or 295 respondents were successfully interviewed. The questions were derived from Gold's survey work and local residents were trained for interviewing the respondents. Frequency of responses and cross tabulations were used to analyze the data, to ascertain the relationship of demographic and socioeconomic characteristics in predicting people's attitudes and positions with regard to coal development.

Social Impact Analysis of Campbell County, Wyoming (Blevins, Thompson, Ellis, 1974)

This attitude survey was conducted as part of a larger environmental assessment of coal development proposed by Atlantic Richfield Company. It focused specifically on one area in the Powder River region which had experienced growth from oil development and now faces further growth from coal development. The researchers contacted representatives of local agencies, local officials, and surveyed a random sample of residents to obtain information regarding residentail preferences, attitudes toward community services and toward pending coal development. This information was analyzed, utilizing indices of clusters of attitudes to correlate attitudes to respondent characteristics.

The researchers devote considerable attention to the implications that coal development growth will have for the individual, the family, and on crime and disorder in the study community.

These surveys used a variety of means for learning about people's attitudes and values with regard to current and preferred lifestyles. While they are not focusing on exactly the same areas, together they are a fairly comprehensive view of the cultural lifestyle values of people who live in the Powder River region. Analysis of these data should provide sufficient information to develop a lifestyle profile for ranchers and townspeople. However, development of the lifestyle profile for the several Native American tribes and groups in the region will require further research.

2. Native Americans: Lifestyle Profile Needs

The Crow and Northern Cheyenne Indian reservations lie in the central portion of the Powder River Basin. Both tribes own approximately 498,470 acres of reservation lands; while 1,509,884 acres are individually-owned allotments. Census estimates indicate that approximately 7,500 Indians and 800 non-Indians live on or adjacent to both reservations. An agricultural, rural lifestyle best characterizes the residents although many are employed by government agencies, including the Bureau of Indian Affairs.

Crow and Northern Cheyenne tribal members are keenly aware of the existence of bituminous coal deposits on tribal land and both reservation groups have leased land for coal exploration. Leases are currently being contested, especially by the Northern Cheyenne. If court decisions run against the tribes, a real potential exists for large scale development. Favorable decisions will necessitate that tribal groups develop and maintain a strategy of "controlled development" of their natural resources (McDonald, 1976).

Aside from the general issue of tribes having the right and Congressional support to determine socioeconomic development and planning, three salient issues are at stake: 1) the impact of fossil fuel development on the land and planned efforts to recontour and revegetate mined-out areas, 2) potential conflict between lifestyles and values of construction technologists and

tribal members, and 3) imposed acceleration of social change and potential impact on lifestyle, quality of life, and efforts to maintain traditional customs.

Reservation residents may have little comprehension of the socioeconomic consequences resulting from large-scale influx of construction and mining workers into their areas. Before any assessment or evaluation of Indian attitudes and positions on growth impacts begins, a specific impact-awareness program should be prepared and implemented. Information on changes that could occur at every identifiable reservation/community level should be disseminated. Short-and long-term consequences need to be identified and, together with the impact analysis, presented to the native groups in modes sensitive to acceptable native forms of communication and presentation. Residents can be surveyed to determine the nature and extent of information to be included in the program. Tribal leaders and culturally sensitive resource persons (e.g., research professionals who are knowledgeable about and respected by the Indian community) can help prepare acceptable modes of presentation. Residents should understand the full meaning and consequence of fossil fuel extraction on the physical environment, the maintenance of current traditions and values, and quality of life. The awareness program must present an easily understood picture of community concerns. Program content should be thorough and comprehensive enough to permit Indian residents to form more accurate positions on potential impacts.

Whether development is controlled by tribal officials or determined by resource extractors, eventually Indians will have to live with a new population whose lifestyles will be quite different. McDonald (1976) maintains "that the bringing-in of large numbers of construction technicians with differing value systems sets a collision course with the reservation inhabitants." He concludes that "resolution of the conflicts has a very minimal probability of success if the characteristics...are not researched." As a first step, composite profiles of native groups and construction technicians must be prepared, including information on: inter- and intra-group norms and patterns of association; informal and formal learning styles; community, family and

individual role proscriptions, prescriptions, and methods of attainment; recreation and play; subsistence patterns; temporality; territoriality; and social control.

Sociocultural, psychological, and historical analytic procedures can direct the quality and quantity of the data collection. Profiles accurately portray both Indians and construction technicians. To insure cultural sensitivity of information, indigenous resource persons should be used to the fullest extent possible in data collection and interpretation procedures.

After the profiles are completed they should be analyzed to identify potential sources of intergroup conflict. Involvement of resource persons is essential at this point. The final step is to identify conflict resolution strategies and preventive measures, and prepare methods of introducing strategies into communities.

It is likely that construction technicians know little of the background, mores, and folkways of the Crow and Northern Cheyenne groups. Inaccurate stereotypes and overall lack of understanding of these groups must be overcome through a cultural sensitization program in which each potential immigrant to the region should participate. Program substance and content can take various forms, but the program should be prepared and presented by tribal representatives.

No one can predict with certainty that consequences associated with accelerated social changes on the Crow and Northern Cheyenne reservations will have positive or negative effects on residents and the social environment. However, assurances can and must be built into social impact assessment efforts that involve tribal representatives and respective cultural perspectives to take account of cultural impacts in the development decision making process. The Crow do not represent the Northern Cheyenne. Both groups readily admit that. For this reason each reservation's perspective is separate and distinct and not representative of American Indians in general.

Whatever the outcome, deliberate efforts must address cross-cultural issues in evaluation, research, and planning. Development and use of culturally sensitive instruments, use of indigenous trained and skilled interviewers,

development of inclusive research models and techniques require participation of both native groups. This must occur at all levels of assessment, planning and implementation.

D. COMPOSITE DIMENSIONS

In addition to the several studies pertaining to the Powder River region we have also included dimensions identified as important in a model developed at Battelle. We have attempted to modify this social impact assessment model to apply to the rural ranching and Native American lifestyles found in the areas of Montana and Wyoming we are studying. (See Column 6 in Table 1 for a list of dimensions from this model.) As can be seen in Table 1, this approach includes more dimensions and factors than the other studies--partly because the other studies often were directed to only one or several issues rather than the entire spectrum of social impacts or changes that may result from energy development.

One of the innovative features in the list of dimensions developed in this approach is the use of social indicators to measure the dimension or existing condition and changes in the condition. Briefly, the list of dimensions represents the major components important to the quality of life in any community or area. Changes in these components, resulting from a technological innovation such as coal development, can assuredly be considered social impacts resulting directly from the development activities. Thus to monitor changes in all aspects of social life, and to perform a thorough impact assessment, one needs to consider and measure all these components. The technique for measuring these dimensions or components, suggested by this approach, is to measure changes using social indicators. That is, for each dimension there are certain quantitative indicators which can be used to represent the dimension. The following outline lists the dimensions considered important for any thorough social impact assessment, briefly describing why these dimensions are necessary to any assessment of change in the social quality of life, as well as suggesting the kinds of indicators which can be used to measure these dimensions.

Composite List of Dimensions

A. Demography

1. Population size. The number of inhabitants affects many aspects of the quality of social life in a community, and also provides a baseline for determining amount and rate of population change.
2. Amount of population change. Population growth or decline resulting from the development activity heavily influences or determines the nature and extent of many other social impacts. The indicator for this dimension is an index of annual amount of growth through natural increase during the past 10 years, and annual amount of growth through net migration during the past 10 years.
3. Rate of population change. Very rapid population change can be more difficult to cope with, since a certain lead time is required for the addition of community services or for the development of strategies to cope with a declining population. The indicator for this dimension is an index of annual percentage rate of growth through natural increase during the past 10 years, and annual percentage rate of growth through net migration during the past 10 years.
4. Population density (persons per square mile). The population density of an area has implications for land use patterns, housing and transportation and other public service needs.
5. Age distribution. Certain age groups tend to have special needs and pose special problems; it is important to determine the numbers of the population in these groups, particularly under age 18 and over age 65. This dimension also provides information regarding the employable population.
6. Sex ratio. Numerous problems can occur if the ratio deviates greatly from one-to-one.
7. Ethnic composition. Significant increase or decrease in the size of any ethnic group from its existing proportion of the population can cause various social problems, or change service needs and cultural values.
8. Family size. This affects the need for housing, schools, and many other community services, and is usually measured by the number of children per family.

B. Economy

1. Job opportunities within occupational categories (proportion of vacant positions). Existence of job opportunities affects immigration rates, employment levels, and family incomes.

2. Job distribution among occupational categories (proportion of available jobs in each category). Determines the structure of the labor force and the nature and extent of the division of labor, various service needs, and reflects the values and priorities of the community.
3. Gross county income. The total wealth of a county indicates the financial resources potentially available to meet collective needs.
4. Rate of gross county income change. This measure indicates the degree of stability of the local economy through time; also, rapid change can create numerous problems of adaptation.
5. Employment level. Unemployment creates many problems for those persons affected, and can threaten the stability of the economy. Unemployment levels over the past 5 to 10 years will also indicate the stability of the economy in the area.
6. Participation in the labor force (by women, youth, the elderly, and others previously not employed). Addition of large numbers of new persons to the labor force can affect both income levels and various social activities and needs. Participation is usually measured by proportions of each group in the labor force. A time series should be used if possible, to determine changes in participation.
7. Property tax base (both real and personal). A major determinant of the financial resources currently available to meet collective, public needs.
8. Financial inflow from Federal government. Another factor determining the financial resources currently available to meet collective public needs and the capability to draw on these resources to manage impacts.
9. Public revenues. The amount of financial revenues available to the local government(s) to meet public needs, including the tax base.
10. Price level. Influences purchasing power of both individuals and organizations in meeting their needs, and reflects the degree of stability in the local economy. This is measured by the consumer price index.
11. Availability of retail services. The availability of services (such as banks, food stores, clothing stores and laundries, etc.) affect the quality of life in the community, and also indicate the ease or difficulty with which a community can absorb new growth.

C. Social Structure

1. Median educational attainment. This affects a variety of individual and group activities, especially those involving knowledge or

communication, and provides information regarding likely preferences and patterns of achieving social interaction and goals.

2. Mean socioeconomic status (combined occupational and income status). This affects a variety of individual and group activities, especially those involving economic consumption and exertion of social influence.
3. Availability of unoccupied housing. Housing availability is important in relation to population growth; serious deficiencies will require a large expenditure of resources. This is also a reflection of the economic condition of the community.
4. Amount of space per housing unit. This is a primary consideration for many people in determining their standard of living and personal comfort.
5. Residential stability. This affects the ability of a community to organize and act to meet collective needs, and reflects the quality of life in a community. An index combining mean length of occupancy and dwelling units and the proportion of dwelling units that are owner-occupied is suggested as the indicator for this dimension.
6. Housing type. The availability of certain housing types (single-family dwellings, mobile homes, etc.) will reflect certain levels of satisfaction with the quality of life in the communities.
7. Mass media coverage. An important link in promoting awareness of community problems, individual participation in community activities, and overall community integration. This can be measured by a combined index of combined circulation per capita of all local newspapers, and the number of television channels in the area.
8. Participation or membership in interest organizations. Involvement indicates the support individuals give to these organizations and hence their collective strength, and can be an indication of the ability and tendency of the community to respond to perceived or anticipated changes. An index of number of associations/population and total memberships per capita is a possible indicator for this dimension.
9. Political participation (of all kinds). Reflects individuals' concern for and involvement in public issues, and their commitment to working through legitimate political channels to deal with collective problems. An index of proportion of eligible persons who are registered and the turnout rate in local elections the previous year is a possible indicator.
10. Local government capabilities (structure and functions of all units). Reflects the capabilities and likelihood of local government to deal

with collective problems and public issues. Possible indicators for this dimension include an index of total number of local government employees/population, and the total operating budget of local government per capita.

D. Public Services

Each of the following public services is an important factor in determining the extent to which a community provides for the needs of its inhabitants, and hence the overall quality of social life in that community or area. The extent of each of the services indicates the ability of a community to absorb new growth without many problems. It is important to try and measure use of these services to determine how a population influx can be absorbed. To measure the existence of programs and facilities will not show whether those services are already overloaded or underutilized, and it is this information which is necessary to the planning of programs to help mitigate and manage social impacts.

1. Public education. Possible measurement of this service is an index of the following indicators: mean class size (students per classroom); mean student-teacher ratio and total educational expenditures per student per year.
2. Medical care. Possible indicators include hospital beds/population, vacancy rates at the hospitals, number of mental health clinics/population, number of physicians and dentists/population, range of services, waiting times, and ambulance service.
3. Public health. Possible indicators include total local governmental expenditures on public health per capita per year, number of public health workers/population, number of people served by public health department, number of sanitation employees/population.
4. Fire protection. Possible indicators include civilian fire casualties, number of injuries and death/population, property loss, response time, fire protection classification of the community.
5. Police protection. Possible indicators include property loss, physical casualties, percentage of emergencies responded to within "x" minutes, households victimized, total local government expenditures on police protection per capita.
6. Public transportation. Possible indicators include maintenance expenditures per capita; waiting and travel times; parking availability; auto, public and pedestrian accident rates; total expenditures for public transportation per capita per year; ridership figures for public transportation.

7. Legal services. Possible indicators include number of attorneys/population, total budgets of legal service centers per capita, waiting times for services, range of services.
8. Social services. Possible indicators include number and range of social service programs, number of population needing the service who currently use the service, number of professionals/population, waiting times for services.
9. Public facilities (solid waste, water supply, waste water treatment, road maintenance). Possible indicators include existence of services (garbage collection, etc.), rodent hazards, health hazards, flow adequacy for water supply, percent hydrants restricted on use, adequate treatment capacity and sewage capacity, level of treatment, overloading of facilities, rate of repair and breakdown, total expenditures for street maintenance per capita.
10. Recreational and cultural facilities. Possible indicators include accessibility to facilities (travel time, travel mode, etc.), number of programs and facilities/population--swimming pools, hunting and camping areas, local entertainment programs, waiting times.

E. Social Well-Being

Excesses in each of the following areas are commonly considered serious social problems with which a community must deal, and which can produce social disorganization if extensive.

1. Crime and delinquency. Possible indicators include number of violent crimes/population, number of property crimes/population, number of serious delinquency violations/juvenile population.
2. Alcohol and drug abuse. Possible indicators include number of people treated for alcoholism or drug abuse/population needing treatment, number of contacts made with alcohol and drug abuse programs/population needing programs.
3. Physical and mental illness. Possible indicators include hospitalization rate/population, disability days per year per capita, suicide rate/population.
4. Racial and sexual disparity. Possible indicators include ratio of minority to white unemployment rates, ratio of minority to white family income, ratio of female to male unemployment rates, ratio of female to male income.
5. Family disruption. Possible indicators include number of divorces filed/population, proportion of all families with one adult.

6. Educational difficulties. Possible indicators include rate of school dropouts/student population, functional illiteracy (less than 5 years of education) rate/adult population.
7. Employment difficulties. Possible indicators include gross labor turnover per year, proportion of unemployment compensation recipients receiving maximum benefits.
8. Poverty. Possible indicators include proportion of all families below the official poverty line, proportion of all families receiving public welfare.
9. Substandard housing. Possible indicators include proportion of housing units classified as dilapidated, proportion of housing units without plumbing.
10. Environmental degradation. Possible indicators include an index of environmental elements whose quality is significantly reduced by development. (Data from environmental impact statements, and environmental researchers should be used to develop an index--e.g., to define at what level air quality is significantly reduced, etc.)

III. FROM ASSESSMENT TO MANAGEMENT: USING AND INTEGRATING THE INFORMATION

A. PERFORMING THE ASSESSMENT

This discussion of a plan for a social impact assessment of the Powder River region has emphasized reliance on the existing studies and data sources and incorporation of lifestyle profiles into an indicator approach to assessment. This section will describe in more detail how to integrate that information and how to use the results of the assessment to determine where and when impact management capabilities will be needed, and how they can be developed or obtained.

To incorporate data generated by lifestyle profiles into the overall social impact assessment, one must identify those variables which residents of the area perceive to be important to the quality of their lives. In the Powder River region, such variables include closeness to the land, isolation from urban life, independence and privacy. A list of these variables should be generated from the attitude surveys taken in the region (see Table 2). These variables should be used as representative of community priorities and must be added to the list of objective dimensions if they are missing.

An important point that should be emphasized again here is that the choice of objective dimensions used is often a value choice in itself, and the choice of indicators used to measure the dimensions is also a value choice. Researchers, when performing the actual social impact assessment, must be very careful to clearly state why certain dimensions and indicators are chosen and what the indicators actually measure.

Thus, it is extremely important to learn as much as possible about the area under investigation and its residents. Attitude surveys can provide much useful information for this purpose. One of the most serious errors to avoid is the error of omission--leaving out a dimension because the researcher did not consider it important, only to discover the dimension is critical to a certain aspect of the culture of the area as perceived by the residents. For example, not considering day care facilities under the provision of public

and social services might mean that the researcher is missing an important monitor of the ease with which women in a rural community are able to work outside the home. Thus, researchers must step out of their own lifestyles and preferences to determine what dimensions and indicators to use. It would be advisable to check proposed lists of dimensions and indicators with a sample of local residents in order to eliminate the possibility of such omissions.

The list of objective dimensions is considered complete when it reflects the addition of more qualitative variables important to the region's unique lifestyle. Next, the indicators to measure these dimensions must be chosen, based on data availability and accuracy and knowledge of community priorities and lifestyles. Then the data for each of the indicators is collected (see Appendix A for a partial list of Powder River region and Rocky Mountain data sources).

Once data have been gathered for the indicators, providing information on the existing condition of each dimension, the impact of coal development must be projected for each dimension. These projected impacts will vary according to the level of development or the scenario used, and several sets of projected impacts should be made if there is more than one development scenario. While it is generally the responsibility of the developer or the approving or licensing agency to make and provide projections regarding alternative potential levels of resource development and the resulting impacts or requirements, often the assessment of social impacts is sketchy at best. One particular additional element should be considered in the social impact assessment scenarios when large-scale short-term development is contemplated. Many resource developments are characterized by a boom-bust cycle that parallels the construction and operation phases, with the primary focus on the impacts of the boom cycle. Although the need to predict and cope with the consequences of the "bust" cycle is acknowledged, little has been done to actually predict and measure anticipated consequences of the rapid decline of a development effort. These projections should be incorporated into the assessment of social impacts as a comprehensive picture of the overall effects of the development on the community and region.

In order to project impacts one must develop projections for each of the indicators used to measure the dimensions. The basic purpose of the projections is to determine how much change occurs in each social indicator (and hence each dimension) between time₁ (before the development) and time₂ (after the development), and perhaps also at subsequent intervals of time₃, time₄, etc. In other words, amount of social change on variable A equals the value of indicator A at time₂ minus the value of indicator A at time₁, or:

$$\Delta A = A_{\text{time}_2} - A_{\text{time}_1}$$

In addition, however, we want to determine how much of that observed change is actually caused (either directly or indirectly) by the particular development activity under investigation, as opposed to all other events and social trends occurring in the community. Hence our approach would be that of Figure 1:

FIGURE 1. Impact Magnitude Determined by Comparing Impacted Indicator (A) with Estimate of Indicator (A) Not Impacted.

In this approach, the magnitude of the impacts resulting from the development under investigation is determined by comparing the value of each indicator (such as A) at time₂ with what that value would have been at that time had the energy development not occurred. In short:

$$I = A_{\text{time}_2, w_d} - A_{\text{time}_2, w/o_d}$$

A critical aspect of this approach, obviously, is estimating the hypothetical value of A_{time_2} without the effects of the development. There are three ways to estimate this value, all of which are at best only crude approximations: 1) If a time trend can be established for variable A during the years preceding time₁, this trend can be extrapolated to time₂ with fair accuracy, especially if the time period involved is not too great; 2) The community or county being studied can be matched (on as many variables as possible) with another community or county not experiencing the innovation, and the value for indicator A at time₂ in the control community or county taken as an estimate of $A_{\text{time}_2, w/o_d}$ in the area being studied; 3) The national mean (or median) for A_{time_2} can be applied to the community or county under investigation as an estimate of $A_{\text{time}_2, w/o_d}$ in that area.*

Thus this formula or approach, when applied to each of the indicators, will clearly indicate areas in which the community will experience impacts. Deficiencies in its ability to cope with projected consequences of development and growth given existing conditions and capabilities will be revealed.

When performing the actual social impact assessment, the researcher also may want to consider a weighting scheme for the dimensions chosen to reflect the relative importance of each of those social variables. In addition, the researcher also may want to attempt to identify the relationships between all the dimensions.

B. MANAGING THE IDENTIFIED SOCIAL IMPACTS

The final phase of the social impact process should involve 1) an assessment of current capabilities in the community and region for coping with or

* This discussion is based on work done at Battelle on a Social Life Indicator approach to Social Impact Assessment.

managing the projected impacts and 2) an assessment of strategies and tools that could be utilized by the affected area to improve its management capabilities to meet projected needs and demands. The first step in this process is to survey the existing planning and governmental organizational structures and resources in the community and/or region. The resulting list may be compiled by obtaining information from existing studies (e.g., Mountain Plains Federal Regional Council, Region VIII, 1975) and data regarding the number and types of agencies that currently exist in the affected communities and counties, and the services and programs provided by these agencies.

The second step in this process is to identify and compile into a comprehensive list the availability and current use of outside resources, particularly state, Federal, and private sector assistance programs (HUD, 1976; FEA, 1976). While it is possible that certain communities or regions have planning and governmental structures and programs capable of handling rapid growth problems, current information indicates that most rural communities in the Powder River region do not. There, local and county governments are small and planning is minimal if not altogether absent. Further, to date little use has been made of outside sources of technical and financial assistance. Therefore, it will be necessary to develop and implement tools and programs to handle the problems or significant impacts that have been projected.

At this point a resource list must be developed to inform the communities and region of the planning strategies, tools, programs and other resources available to them to prevent, ameliorate and manage projected impacts that currently they are not prepared to handle. Such a list should be specific about the types of tools or programs available; the procedures for designing, or obtaining and using them; and exactly what they are intended to accomplish. These various resources should be categorized by impact areas, using the factors and indicators in the social impact assessment model as a framework. For example, in the area of housing: tools such as building codes; zoning categories such as Planned Unit Developments, subdivision regulations; and resources such as HUD housing assistance programs, 701 planning grants, and FHA assistance all help a community to plan for and achieve adequate housing for the expected and current populations.

An alternative strategy that should be considered in social impact management of any large scale project is the possibility of isolating the potential work force rather than integrating it into existing communities. Whether labeled as new communities or company towns, this alternative is crucial to the issue of retaining a rural lifestyle in many of the sparsely populated western states that are faced with resource development-related growth.

Additionally, some guidelines or resource materials should be provided which list potential planning tools and programs that can provide assistance to areas faced with not only short term rapid growth but also rapid decline. Table 3 is a partial list of tools and resources that may be used by communities in this impact management process; further resources are cited in Appendix A.

TABLE 3. Suggested Tools for Managing and Mitigating
Impacts: A Partial List

1. Growth Management (Demography)

- a. Area wide planning districts; regional councils of government.
- b. University consulting and research groups (e.g., Montana's Community Services Program).
- c. State growth plans.
- d. Project Coordinator or Administrative Officer (see HUD handbook).
- e. New Towns plan (see HUD handbook).

2. Fiscal Tools (Economy)

- a. Manpower planning (training programs for local unemployed).
- b. Special zoning/tax for agricultural lands.
- c. Taxes--sales, property, occupation, income, severance.
- d. Bonds--e.g., industrial development and revenue.
- e. Special districts (e.g., local improvement district).

3. Social Structure

- a. Land use and community plans--including housing and transportation, etc.
- b. Housing and building codes--general
- c. Mobile home regulations, standards.
- d. Housing rehabilitation and preservation programs.

TABLE 3. (contd)

- e. Community centers.
 - f. Community councils/citizen advisory boards.
 - g. Community planner.
 - h. Information program--via local media.
4. Public Services
- a. Contracting for public services--e.g., police, fire.
 - b. Package sewage treatment plants (see HUD handbook).
 - c. Transit-jitney service, dial-a-ride, demand transit.
 - d. Health Maintenance Organization (HMO's).
 - e. Mobile public services--libraries, recreational instruction.
 - f. Recreation centers.
5. Social Well-Being
- a. Community legal aid centers.
 - b. Human resources centers--e.g., community mental health centers.
 - c. Community day care centers.
 - d. Counseling centers.

The final step in the impact management phase is to analyze the uses of these resources, the extent of their usefulness and the role of each effectively and proactively planning for the anticipated social impacts of coal development in the Powder River region. This step has not been accomplished in most social impact assessment studies to date, yet it seems important to giving impacted communities the benefit of the experiences of other communities. Several studies and documents are available or in the process of being completed that should provide much of this information (see Appendix, Sections B and E).

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APPENDIX A

BIBLIOGRAPHY

APPENDIX A

BIBLIOGRAPHY

- Bender, L. D. and R. I. Coltrane. (1975) "Ancillary Employment Multipliers for the Northern Plains Province," presented to Western Agricultural Economics Research Council, Reno, Nevada (January 7-9).
- Bingaman, Anne K. (1970) "New Mexico's Effort at Rational Taxation of Hard Minerals Extraction" Natural Resources Journal, Vol. 10, No. 3, (July).
- Bleiker, Hans. (1974) "Community Planning for Coal and Oil Shale Development: Or a Strategy for Boom Town Planning" Submitted for presentation at American Institute of Planners Annual Conference.
- Blevins, Audie, L. Jr., James G. Thompson and Carl Ellis. (1974) Sociological Impact Analysis of Campbell County, Wyoming, Prepared for the Wyoming Environmental Institute under contract with Atlantic Richfield Company (December).
- Booz, Allen and Hamilton, Inc. "A Procedures Manual for Assessing the Socio-Economic Impact of the Construction and Operation of Coal Utilization Facilities in the Old West Region" Washington, D.C.
- Briscoe, Maphis, Murray and Lamont, Management Consultants. (1974) Tax Lead Time Study for the Oil Shale Region: Fiscal Alternatives for Rapidly Growing Communities in Colorado, Colorado Geological Survey, Department of Natural Resources, State of Colorado.
- Bronder, Leonard D. (1976) Taxation of Coal Mining: Review with Recommendations, Western Governor's Regional Energy Policy Office, (January).
- Bureau of Reclamation and Institute of Applied Research, Montana State University. (1975) Anticipated Effects of Major Coal Development on Public Services, Costs and Revenues in Six Selected Counties. Prepared for Northern Great Plains Resources Program (January).
- Carnes, Sam and Paul Friesma. (1974) Urbanization and the Northern Great Plains, NGPRP report, Northwestern University.
- Community Service Program. (1975) Final Report: A Study of Social Impact on Coal Development in the Decker-Birney-Ashland Area, University of Montana, for Montana Energy Advisory Council, (July 31).
- Council on Economic Priorities. (1974) "Leased and Lost: A Study of Public and Indian Coal Leasing in the West," Economic Priorities Report, Vol. 5, No. 2.

- Denver Research Institute. (1975) Social and Economic Impacts of a Fort Union Coal Processing Complex, Denver (NTIS No. FE-1526-T-1).
- Denver Research Institute. (1974) Socio-Economic Impacts of Proposed Burlington Northern and Chicago Northwestern Rail Line in Campbell-Converse Counties, Wyoming, Denver.
- Development Research Associates and Green Associates. (1974) Housing and Community Services for Coal Gasification Complexes Proposed on the Navajo Reservation. Prepared for El Paso Natural Gas Company and Western Gasification Company, New Mexico.
- Federation of Rocky Mountain States. "A Typical Boom Area in the Rocky Mountain Region: Its Problems for State and Industry Planning." Technical paper 700-74-8.
- French, Cecil L. (1974) "Attitudes of Johnson County, Wyoming Residents Toward Selected Aspects of their Environment." Prepared for the Northern Great Plains Resources Program, (April).
- The Future of the Human Environment in the Rocky Mountain States. (1974) Annual Report and Proceedings of the Tenth Annual Meeting, East Glacier Park, Montana (September 4-5).
- Gilmore, John S. (1976) "Boom Towns May Hinder Energy Resource Development," Science, Vol. 191, February 13, pp. 535-540.
- Gilmore, John S. and Mary K. Duff. (1975) Boom Town Growth Management: A Case Study of Green River, Wyoming. Boulder, Colorado: Westview Press.
- Gilmore, John and Mary K. Duff. (1973) "Policy Analysis for Rural Development and Growth Management in Colorado," Denver, Colorado: Colorado Division of Planning (Sponsored by the Colorado Rural Development Commission).
- Gold, Raymond. (1974) A Comparative Case Study of the Impact of Coal Development on the Way of Life of People in the Coal Areas of Eastern Montana and Northeastern Wyoming: Final Report, University of Montana, Institute for Social Science Research, Section Edition (June 30).
- Helgeson, D. L. and M. J. Zink. (1973) "A Case Study of Rural Industrialization in Jamestown, North Dakota," Department of Agricultural Economics, North Dakota State University, Fargo.
- Intermountain Planners and Wirth-Burger Associates. (1974) Capitol Facilities Study Powder River Basin for the Wyoming Department of Economic Planning and Development, Cheyenne, Wyoming.
- Jobs, Patrick C. and Milton G. Parsons. (1975) "Satisfaction, Coal Development and Land Use Planning: A Report of Attitudes Held by Residents of the Decker-Birney Study Area." Submitted to Montana Energy Advisory Council (April 30).

- Kohrs, ElDean V. (1974) "Social Consequences of Boom Growth in Wyoming"
Unpublished paper.
- Kutak, Rock, Cohen, Campbell, Garfinkle and Woodward. (1974) A Legal Study Relating to Coal Development-Population Issues (six volumes). A Report to the Old West Regional Commission by Kutak, Rock, Cohen, Campbell, Garfinkle and Woodward, Omaha, Nebraska.
- Leholm, A. G., F. L. Leistritz and T. A. Hertsgaard. (1974) "Local Impacts of Energy Resources Development in the Northern Great Plains," Department of Agricultural Economics, North Dakota State University, Fargo (September).
- Leholm, A. G., F. L. Leistritz and T. A. Hertsgaard. (1975) "Fiscal Impact of a New Industry in a Rural Area: A Coal Gasification Plant in Western North Dakota." Paper presented at the Seventh Annual Meeting, Midcontinent Section, Regional Science Association (June 13-14).
- Leistritz, F. L. and T. A. Dalsted. (1974) "The Economic Impact of Coal-based Energy Development in Western North Dakota," North Dakota Farm Research, Vol. 31, No. 6, pp. 12-16.
- Leistritz, E. F. and T. A. Hertsgaard. (1973) "Coal Development in North Dakota: Effects on Agriculture and Rural Communities," North Dakota Farm Research, Vol. 31, No. 1, pp. 3-9.
- Lindauer, R. L., Jr. (1974) Solutions to the Economic Impact of Mineral Development on Local Governments. Paper presented to the National Resources Council, Federation of Rocky Mountain States, Denver, Colorado.
- Luken, R. A. (1974) Economic and Social Impacts of Coal Development in the 1970's for Mercer County, North Dakota. A Report for the Old West Regional Commission by Thomas E. Carroll Association, Washington, D.C.
- Matson, Roger A. and Jeanette B. Studer. (1974) Energy Resources Development in Wyoming's Powder River Basin: An Assessment of Potential Social and Economic Impacts. Prepared by Water Resources Research Institute, University of Wyoming, in cooperation with Economic Research Service, U.S. Department of Agriculture for NGPRP (May).
- McDonald, Arthur, PhD., Executive Director, Cheyenne Consulting Corporation. Lame Deer, Montana. Personal communication in May, 1976.
- Muller, T. and G. Dawson. (1972) The Fiscal Impact of Residential and Community Development: A Case Study, Urban Land Institute, Washington, D.C.
- Native American Natural Resources Development Federation of the Northern Great Plains. (1974) Declaration of the Indian Rights to the Natural Resources in the Northern Great Plains States, NGPRP report (June).

Nellis, L. (1973) "What Does Energy Development Mean for Wyoming?"
Unpublished research.

Northern Great Plains Resources Program. (1975) Effects of Coal Development in the Northern Great Plains: A Review of Major Issues and Consequences at Different Rates of Development.

Northern Great Plains Resources Program. (1974) Socio-Economic and Cultural Aspects Work Group Report. Discussion draft (June).

Olsen, Marvin E. and Donna J. Merwin. (1976) "Toward a Methodology for Conducting Social Impact Assessments Using Quality of Social Life Indicators." Battelle Human Affairs Research Centers. Prepared for ERDA Regional Studies Program (June).

Polzin, P. E. (1974) "Water Use and Coal Development in Eastern Montana," Montana University Joint Water Resources Center, Bozeman (November).

Planning Support Group, Bureau of Indian Affairs. (1974) Anticipated Socio-Economic Impacts of Coal Development on Indians of the Northern Great Plains for the Northern Great Plains Resources Program.

Prestgard, P. G. (1974) "Effects of Coal Development on Public Costs and Revenues in North Dakota." Unpublished Master's thesis, North Dakota State University, Fargo.

Rapp, Donald S. (1976) Western Boomtown: Part I: A Comparative Analysis of State Action, Special Report to the Governors, Western Governors' Regional Energy Policy Office, June 1976, Staff report.

The Science and Public Policy Program. (1975) Energy Alternatives. A Comparative Analysis, U.S. Government Printing Office (May).

Stenehjem, Erik J. (1975) Forecasting the Local Economic Impacts of Energy Resource Development: A Methodological Approach. Argonne National Laboratory, Environmental Systems Division (December).

U.S. Department of the Interior, Bureau of Reclamation, Upper Missouri Region. (1973) Wyoming Population Estimates for Time Frames of 1980, 2000, 2020 (August 15).

U.S. Department of the Interior, Geological Survey. (1974) Final Environmental Statement: Proposed Plan of Mining and Reclamation, Big Sky Mine, Peabody Coal Company, Coal Lease M-15965, Colstrip, Montana.

U.S. Senate, Committee on Interior and Insular Affairs. (1974) Hearing Before the Subcommittee on Minerals, Materials and Fuels on the Department of Interior's Future Leasing Program for the Federal Coal Resources of the Northern Great Plains Part II. U.S. Government Printing Office (April 18).

Woodward-Envircon, Inc. (1974) "Socioeconomic Characterization and Assessment of the North Dakota Coal Gasification Project Area," prepared for the Michigan-Wisconsin Pipeline Company (September).

Wyoming Department of Economic Planning and Development. (1974) Coal and Uranium Development of the Powder River Basin: An Impact Analysis. Cheyenne, Wyoming.

APPENDIX B

ONGOING RESEARCH PROJECTS

APPENDIX B

ONGOING RESEARCH PROJECTS*

Project: Changes in Population and Community Services Related to Changes in Industrial Structure of Rural Communities.

Contact: Lloyd D. Bender, Economist
Department of Agricultural Economics
Montana State University
106 Linfield Hall
Bozeman, Montana 59715

Scope: To analyze consequences of alternative coal development on needs for infrastructure and costs and revenues of local governments. To be completed June 30, 1976.

Project: Legal Analysis of Federal Programs Which Could Supply Infrastructure Support to Energy Resource Development Impacted Towns.

Contact: Ellen S. Brown
Office of Environmental Programs
Federal Energy Administration
12th and Pennsylvania Avenue, N.W.
Washington, D.C. 20461

Scope: To assess availability of Federal funds for infrastructure building, and explore the means for expediting delivery of those funds to energy development impacted towns. To be completed January 20, 1976.

Project: Labor Market Information for Expanding Energy Production in The Rocky Mountain-Northern Great Plains Region.

Contact: Robert J. Brown
U.S. Department of Labor, ETA
1961 Stout Street
Denver, Colorado 80202

Scope: Literature surveys and case studies of manpower developments in energy impacted communities. To be completed November 30, 1976.

* An excellent source of information regarding ongoing research is published quarterly: Old West Regional Commission and USDA Forest Service Surface Environment and Mining (1976), Energy Research Information System: Quarterly Report. Billings, Montana.

Project: Community Assistance Manual

Contact: Mr. George Collins
Environmental Protection Agency
1860 Lincoln Street
Denver, Colorado 80203
(303) 837-3886

Scope: This manual will be useful to local community leaders to assess impacts and plan programs to minimize the socioeconomic and environmental effects.

Project: Socioeconomic Impacts of Coal and Oil Shale Development in the Intermountain West

Contact: Dr. Joan Davenport
Federal Energy Administration
Room 7110
12th and Pennsylvania
Washington, D.C. 20461
(202) 961-8409

Scope: This project will assess population increases, employment increases, school enrollments, land conversions, etc. resulting from coal and oil shale development in the West Project Independence. Scenarios will be used as inputs.

Project: Socioeconomic Impact Assessment Handbook

Contact: Michael L. Frankel
Centaur Management Consultants, Inc.
Suite 465
1120 Connecticut Avenue, N.W.
Washington, D.C. 20036

Scope: This is a handbook for socioeconomic assessments of energy developments being prepared for the Energy Research and Development Administration. It is intended for use by local, state and regional officials.

Project: Social Impact Assessment Notebook

Contact: Richard P. Gale
Department of Sociology
University of Oregon
Eugene, Oregon 97403

Scope: This is a notebook being prepared for the Forest Service, detailing the framework and major steps in how to perform an assessment.

Project: Bridging Resource and Social Variables: A Project to Learn How to Plan for and Manage "People Problems" Associated with Resource-Related Development.

Contact: Raymond L. Gold, Director
Community Service Program
University of Montana
Missoula, Montana 59801

Scope: To help agencies incorporate social impact assessment into their decision-making process and to related social impacts to other physical and biological impacts. To be completed June 30, 1976.

Project: Health Impacts of Environmental Pollution in Energy Development Impacted Communities

Contact: Mr. Mike Hammer
Environmental Protection Agency
1860 Lincoln Street
Denver, Colorado 80203
(303) 837-3073

Scope: An evaluation will be received of public health problems due to stress on public utilities and services. This information will be used to help prevent and solve public health problems.

Project: Alternative Methods for Financing Public Services

Contact: Mr. George Muller
Economic Development Administration
909 17th Street, Suite 504
Denver, Colorado 80202
(303) 837-3511

Scope: The project will be conducted in Colorado, but will be structured to provide information of regional value.

Project: Technical Assistance

Contact: Mr. George Muller
Economic Development Administration
909 17th Street, Suite 504
Denver, Colorado 80202
(303) 837-3511

Scope: An interdisciplinary team will be utilized by the University of Wyoming in Gillette to provide technical assistance.

Project: Indian Labor Survey

Contact: Mr. George Muller
Economic Development Administration
909 17th Street, Suite 504
Denver, Colorado 80202
(303) 837-3511

Scope: Study will be conducted in cooperation with the United Tribes of North Dakota Development Corporation to obtain information toward off reservation employment, existing skills, retrainability and training facilities available for employment in coal liquification and gasification industry.

Project: Western Regional Energy Development Study - Phase III Secondary Impacts

Contact: Mr. Marvin Singer
Council on Environmental Quality
722 Jackson Place, N.W.
Washington, D.C. 20006

Scope: Several energy development options have been postulated by CEQ for western energy resources. This study will look at the secondary impacts.

Project: Estimation of Amenity Values as Opportunity Costs for Energy-Related Water Use in Montana

Contact: Richard L. Stroup
Department of Agricultural Economics
Montana State University
Bozeman, Montana 59715

Scope: To develop, apply and test methodologies with which to evaluate the in-stream recreation and aesthetic values of water being considered for consumption by energy conversion operations in Montana. To be completed March 31, 1976.

Project: Technical Assistance

Contact: Ms. Jeannette Studer
Old West Regional Commission
The Fratt Building, Suite 306A
Billings, Montana 59101
(406) 245-6711

Scope: This two-year program utilizes several methods of providing technical assistance to boom towns including personnel and programs in Montana, Wyoming and North Dakota.

Project: Construction Worker Profile

Contact: Ms. Jeannette Studer
Old West Regional Commission
The Fratt Building, Suite 306A
Billings, Montana 59101
(406) 245-6711

Scope: To help individuals and communities anticipate the impacts of construction projects associated with the development of coal. The study will be composed of surveys on relevant construction projects in the Rocky Mountain region, analysis of the data and development of tools for standard forecasting procedures.

Project: A Longitudinal Socioeconomic Study

Contact: James G. Thompson
Department of Sociology
University of Wyoming
Laramie, Wyoming 82071
(307) 766-6370

Scope: This department is fielding a longitudinal study this summer under contract with the Old West Regional Commission--will focus on validating projected impacts of energy development in NGP region.

APPENDIX C

AGENCIES PROVIDING ASSISTANCE

APPENDIX C

AGENCIES PROVIDING ASSISTANCE

1. Federal Agencies

- a. Federal Energy Administration (FEA): provides technical assistance to communities and states for impact management.
- b. Department of Housing and Urban Development (HUD): provides financial and technical assistance to states and communities. Of particular relevance are their 701 planning grants and community development block grant programs.
- c. Department of Health, Education and Welfare (HEW); provides financial and technical assistance to states and communities for health planning and for health facilities and programs. New HMO planning grants are of importance here.
- d. Environmental Protection Agency (EPA): provides technical, but primarily financial assistance to states and communities, mostly through the 208 Water Quality Planning grants.
- e. Department of Agriculture, Rural Development Service: provides financial assistance to communities and regions.
- f. Department of Transportation (DOT): provides financial assistance for local and regional transportation planning and construction.
- g. Law Enforcement Agency Administration (LEAA): provides technical and financial assistance for planning and program development in law enforcement, criminal justice systems.
- h. Department of Labor (DOL): provides financial and technical assistance in form of provision of data, studies to help in manpower planning direct employment and through CETA program.
- i. Farmers Home Administration (FHA): provides financial assistance to communities (grants and loans) for public facilities and business and industrial development.
- j. Department of Interior:
 - (1) Bureau of Indian Affairs (BIA): provides technical and financial assistance to Indian tribes and groups for planning and program development.

- (2) Bureau of Outdoor Recreation (BOR): provides technical and financial assistance for recreation planning and program development.
- (3) Bureau of Land Management (BLM): provides technical assistance in land-use planning, authorized to manage federal lands.

2. Regional

- a. Federation of Rocky Mountain States, Incorporated, Denver, Colorado: technical assistance, policy-recommending body for member states regarding interstate issues such as growth management.
- b. Mountain Plains Federal Regional Council, Region VIII: representatives of major Federal agencies provide technical assistance to communities and states affected by large scale development impacts.
- c. Western Governors' Regional Energy Policy Office: intergovernmental cooperation effort to coordinate planning among Western states. Provides policy information to states and communities.
- d. Old West Regional Commission (EDA, Department of Commerce): provides financial and technical assistance to region, states, communities and groups for economic development related planning, research and programs.
- e. Missouri River Basin Commission: interstate group to coordinate river basin planning, particularly concerning the use of water; information resource for effects of development on water and on agricultural lifestyle.
- f. Yellowstone River Compact Commission: coordinating group (states and communities) for river basin planning, particularly concerning uses of water, implications for community lifestyles.
- g. Northern Great Plains Resources Program: consortium of agencies and states to study problems related to resource development in Northern Great Plains region. Provides technical assistance in form of commissioning studies, making recommendations regarding energy resource development in the Northern Great Plains region.

3. State (agencies/entities relevant to social impact assessment)

a. Wyoming:

- (1) Wyoming Industrial Siting Council: may provide communities indirect assistance by considering social impacts in energy siting decisions, by requiring social impact management steps.

- (2) Department of Economic Planning and Development (DEPAD): responsible for planning economic and physical resources of state; provides technical assistance to communities in planning in these areas.

b. Montana:

- (1) Department of Health and Environmental Sciences: technical assistance in managing air and water quality impact on communities and regions.
- (2) Montana Energy Advisory Council: coordinates energy related activities of state agencies; socioeconomic impact research in Fort Union region, information source.

c. Indian Reservations

- (1) Northern Cheyenne Tribal Council, Lame Deer, Montana.
- (2) Crow Tribal Council, Crow Agency, Montana.

APPENDIX D

SELECTED INSTITUTIONS AND ORGANIZATIONS

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SELECTED INSTITUTIONS AND ORGANIZATIONS

1. University of Montana, Missoula, Montana Community Service Program and Joint Water Resource Center: both have conducted research on social and environmental effects of coal development.
2. Montana State University, Bozeman, Montana Institute of Applied Research, research on social impacts, service impacts of coal development.
3. North Dakota State University, Fargo, North Dakota, Department of Agricultural Economics: participate in NGPRP studies.
4. University of Wyoming, Laramie, Wyoming Sociology Department: research on social impacts of coal development. Wyoming Environmental Institute; research on environmental and social issues related to resource development.
5. University of Denver Research Institute, Denver, Colorado: research on energy development, social impacts.
6. Rocky Mountain Center on Environment, Denver, Colorado: research on Rocky Mountain area resource development.
7. Powder River Basin Resource Council, Wyoming: private organization, source of information on coal leases in Wyoming.
8. Northern Plains Resource Council, Montana: private organization, source of information on coal and water developments in Montana.

APPENDIX E

HANDBOOKS/RESOURCE PUBLICATIONS

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HANDBOOKS/RESOURCE PUBLICATIONS

1. Baird, Justus N. Jr., United Engineers and Constructors, Inc. (1975), Guidelines for the Preparation of Environmental Reports for Fossil-Fueled Steam Electric Generating Stations, Draft Report, For U.S. Department of the Interior (OWRT and OEPR).
2. Committee on Socioeconomic Impacts of Resource Development (1975), Socioeconomic Impacts and Federal Assistance in Energy Development Impacted Communities, Federal Region VIII, Mountain Plains Federal Regional Council, Region VIII (July).*
3. Environmental Protection Agency, Community Assistance Manual. For complete description, see Ongoing Projects Section.
4. Frankel, Michael L., A Handbook for Socio-Economic Impact Assessments of Energy Developments for Local, State and Regional Officials (ongoing project for Energy Research and Development Administration--see Ongoing Project Section).
5. Gale, Richard, Social Impact Assessment Notebook, ongoing project for U.S. Forest Service--see Ongoing Project Section.
6. U.S. Department of Housing and Urban Development (1976), Rapid Growth from Energy Projects: Ideas for State and Local Action, a program guide. 701 Comprehensive Planning Program in cooperation with the Federal Energy Administration.
7. Boulding, Russell (1974), Environmental Who's Who for Northern Great Plains Energy Development, Environmental Defense Fund.
8. Northern Great Plains Resources Program (1973), NGPRP Status Report (October).
9. Federal Energy Administration, Region VIII (1976), Socioeconomic Impacts and Federal Assistance in Energy Development Impacted Communities, Region VIII, support document for Mountain Plains Federal Regional Council report (May).*

* These reports are good data sources for information regarding impact management capabilities in the Rocky Mountain region.

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