# EFFECTS OF ENERGY DEVELOPMENT IN RURAL AREAS: A CASE STUDY

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Energy development is changing the social and economic climate throughout the western United States. In western North Dakota, large energy development projects are springing up in small, rural areas that are often not prepared for the changes these projects can bring. The results of a case study of a small, rural area affected by construction of a large mine-mouth electric power plant (the Coal Creek Station) are reported here to demonstrate how one area dealt with these changes.

The analysis presented here is an attempt to meet the need for retrospective analyses of the socioeconomic impacts of energy resource development. The socioeconomic effects of power plant construction and operation during the period 1975-1981 were examined and the actual change in key economic and social indicators compared with those projected in two impact studies conducted during the early stages of project development (5, 7). The information represents an analysis of the actual impacts of a major resource development project, an evaluation of the reliability of anticipatory impact assessments, and an initial evaluation of the need for and effectiveness of planning and impact management measures.

The Coal Creek Station, owned by United Power Association and Cooperative Power Association (UPA/CPA), is located in McLean County (Figure 1). The plant site is about five miles south of the town of Underwood. Construction of the plant began in 1975 and was completed in 1980. The total investment for the plant, transmission lines, and coal mine was $1.2 billion. Major factors considered in selecting the 2,500 acre site between Washburn and Underwood were availability of lignite coal in the immediate area and availability of water from the nearby Missouri River. Selection of the McLean County site necessitated construction of 435 miles of 400KV power lines to Delano, Minnesota.

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*This article is based on a report by the authors: Socioeconomic Effects of Large-Scale Resource Development Projects in Rural Areas: The Case of McClean County, North Dakota* (Fargo: North Dakota State University, Department of Agricultural Economics, 1981). A copy of this report is available upon request from F. Larry Leistritz.

**Background: Area Development**

In order to properly evaluate the impacts of the Coal Creek Station, it is necessary to place its construction in the context of other coal-related activity in west-central North Dakota. Since the mid-1960s, eight coal-fired power plants have been constructed in McLean, Mercer, and Oliver Counties. In addition, construction of the nation's first commercial coal gasification plant has recently been initiated in Mercer County. All of these plants are fueled by lignite coal mined in McLean, Mercer, and Olvier Counties, and the water required for their operation comes from the Missouri River and Lake Sakakawea.

The construction and operation of these facilities have had a substantial effect on employment, income, and population in the multicounty region surrounding the sites. The combined construction work force for the various facilities ranged from 1,840 to 4,620 during the period 1977-1979 (Table 1). During this same period, the permanent (operation and maintenance) work forces were expanding at several of these facilities. The increase in these permanent work forces amounted to 450 jobs in 1978 and 820 in 1981. When the power plants and mines are fully staffed in the mid-1980s, their permanent work forces will total about 1,250, excluding the permanent work force of the Great Plains Gasification Project and associated expansion of the Coteau Mine (estimated to total about 950).

Increased employment opportunities and an enhanced population base are often regarded as beneficial aspects of resource development projects. The rapid population growth often associated with construction of energy conversion facilities, however, may lead to problems in providing housing and public services and

**Table 1. Construction and permanent work forces associated with selected coal-fired power plants and coal mines, West-Central North Dakota, 1975-1981.**

| Facility | Year | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981[a] |
| Construction Workers:[b] | | | | | | | |
| Leland Olds, Unit #2 | 300 | | | | | | |
| Square Butte | 400 | 500 | 100 | | | | |
| Coal Creek and Falkirk Mine | 230 | 602 | 1,542 | 2,224 | 2,015 | 520 | 0 |
| Coyote and Mine | | | 197 | 799 | 1,149 | 983 | 318 |
| Antelope Valley and Coteau Mine | | | | 423 | 1,456 | 2,074 | 1,727 |
| Great Plains Gasification | | | | | | 180 | 113 |
| Subtotal, Construction Workers | 930 | 1,102 | 1,839 | 3,446 | 4,620 | 3,757 | 2,158 |
| Permanent Workers:[c] | | | | | | | |
| Leland Olds #2 and Glenharold Mine Expansion | 85 | 85 | 85 | 85 | 85 | 85 | 85 |
| Square Butte and Mine Expansion | | | 80 | 80 | 80 | 80 | 80 |
| Coal Creek and Mine | 36 | 48 | 200 | 285 | 329 | 427 | 437 |
| Coyote and Mine Expansion | | | | | 20 | 75 | 115 |
| Antelope Valley and Coteau Mine | | | | | 2 | 48 | 104 |
| Subtotal, Permanent Workers | 121 | 133 | 365 | 450 | 516 | 715 | 821 |
| Total | 1,051 | 1,235 | 2,204 | 3,896 | 5,136 | 4,472 | 2,979 |

[a]Data reflect employment levels through July 1981.

[b]Number of construction workers represents average work force level for peak quarter for each facility. Mine construction workers are included where applicable.

[c]Number of permanent workers represents average annual employment at each facility.

SOURCE: Interindustry Technical Assistance Team, 1979 and 1981. North Dakota Regional Environmental Assessment Program, unpublished printouts, Bismarck, 1977.

facilities to meet the needs of a rapidly expanding population. Further, small rural communities are often ill-equipped to deal with growth management issues, as they frequently lack financial resources, professional personnel, and experience in coping with rapid change.

During the mid-1970s, North Dakota's decision makers at both state and local levels anticipated many of the growth management problems that could be associated with large-scale coal development. Consequently, several measures aimed at mitigating growth-related problems of communities affected by coal development were enacted into law in 1975 and 1977. These legislative measures concerned the following major subjects: (1) coal severance tax; (2) coal conversion tax; (3) energy facility siting; and (4) environmental information for policymakers.

### Socioeconomic Change: Overview

The actual patterns of socioeconomic change associated with the development of the Coal Creek Station differed from those frequently noted in impact literature. In particular, substantial differences can be noted in such areas as the extent to which local workers participated in project-related employment opportunities, the commuting pattern of project-related workers, and the pattern of population change as the construction period ended.

Local workers obtained a substantial portion of the new jobs associated with Coal Creek development. During the construction phase, about half of the workers were previous residents of the impact area. A survey of the work force conducted in the third quarter of 1976 revealed that local workers made up 61 percent of the work force at that time (9). During the operation phase, more than 90 percent of the plant's permanent work force were living in North Dakota at the time they were hired. About 78 percent now live in McLean County; 42 percent were living in the county when hired by CPA. The rate of local hiring which occurred at Coal Creek was substantially higher than that observed at many energy facility sites in other Western states (3).

The commuting pattern of the construction work force was more extensive than has generally been assumed in connection with energy facility construction projects. Examination of worker commuting and residential patterns indicates the importance of labor union jurisdictional boundaries in explaining settlement patterns and the configuration of impact area boundaries. For example, most of the union locals were located in Bismarck, and about one-third of the construction workers commuted from Bismarck/Mandan. The electricians' local, on the other hand, was headquartered in Minot, and a substantial percentage of these workers commuted from Minot on a daily basis.

Whereas most impact studies have forecast rapid population growth during the period when the construction work force is growing to its peak level, almost all of these analyses have also projected a rapid population decline as the construction phase ends and the operation phase begins (4). The communities that experienced substantial growth during the Coal Creek construction phase, however, did not experience substantial population decline when construction was completed.

Rather, the principal impact communities, Washburn and Underwood, experienced a period of relative popu-

lation stability after the completion of construction. Several factors may have contributed to stabilizing the populations of these communities, but the influence of other construction projects in the area clearly played a major role. In conducting an impact assessment, then, it is imperative to consider the influence of other projects being developed in the area.

### Socioeconomic Impacts

Construction and subsequent operation of the Coal Creek Station resulted in substantial changes in population, costs and revenues of local governments, economic activity, public service needs, and perceptions of local residents concerning resource development and its effects. Some of these changes are only beginning to become evident. The evidence to date, however, does allow several generalizations about the overall effects of the project and comparisons of the impacts of Coal Creek construction with those reported elsewhere.

The first of these changes, population growth, was particularly noticeable in Underwood and Washburn. While McLean County's population grew 9.2 percent from 1970 to 1980, Washburn's population increased 120 percent and Underwood's population grew 70 percent during the same period. Washburn and Underwood experienced rates of population increase that are often associated with severe growth management problems. Yet, in the McLean County setting,the impacts never appeared to become unmanageable. A high percentage of the construction work force commuted from residences outside McLean County (primarily in Bismarck, Mandan and Minot), easing pressures on the communities near the site.

Two other factors were equally important in facilitating effective response to the demands imposed by rapid growth: (1) timely impact information, updated as conditions changed; and (2) state grants and loans made available in both amounts and time frames consistent with local needs. These enabled local governments to develop and implement realistic plans for responding to growth-related needs.

Costs and revenues of local governments have changed; however, the change did not appear to place substantial additional tax burdens on local residents. Overall, while McLean County jurisdictions experienced substantial increases in expenditures associated with construction of the Coal Creek Station, revenue sources have generally kept pace. Major sources of additional revenue have been coal impact grants and loans, property taxes, and, recently, coal severance and conversion tax distributions. No extraordinary fiscal burdens have been placed on local residents as a whole, primarily because of the coal impact grants and loans. It is possible, however, that specific groups, such as the elderly and low-income individuals, may have experienced some hardships resulting from increased property taxes and special assessments. (It should be recognized, of course, that the period 1975-1980 was a time of substantial inflation nationwide and that these inflationary trends may have imposed considerable hardships on individuals with fixed incomes.) Additional analysis of the distribution of project-related benefits and costs among various groups would clearly be desirable.

Coal Impact Office grants were a substantial source of additional revenue for McLean County and its municipalities and school districts during the Coal Creek construction period. McLean County jurisdictions received a total of $5.38 million of such grants during the period 1975-1980 (Table 2). Other coal-related revenues accruing to McLean County jurisdictions during this period included coal trust fund loans ($790,129), coal severance tax distributions ($763,679), and coal conversion tax distributions ($287,329). Coal impact grants and loans played a key role in alleviating the potential fiscal problems of McLean County jurisdictions.

**Table 2. Coal impact fund grants, coal severance tax trust fund loans, coal severance tax distributions, and coal conversion tax distributions received by McLean County jurisdictions, 1975-1980.**

| | |
|---|---|
| Coal Impact Fund Grants:[a] | |
| McLean County | $1,995,991.00 |
| City of Washburn | 755,776.00 |
| Washburn School District | 569,356.00 |
| Washburn Park Board | 54,554.00 |
| City of Underwood | 708,456.00 |
| Underwood Fire District | 37,800.00 |
| Underwood School District | 520,845.00 |
| Underwood Park Board | 60,995.00 |
| City of Wilton | 150,700.00 |
| Wilton School District | 190,000.00 |
| Wilton Park Board | 16,090.00 |
| Wilton Fire District | 7,750.00 |
| City of Turtle Lake | 106,379.00 |
| City of Garrison | 36,693.00 |
| Other McLean County Jurisdictions | 165,400.70 |
| TOTAL, McLean County Jurisdictions | $5,376,785.70 |
| Coal Severance Tax Trust Fund Loans:[b] | |
| City of Underwood | $ 338,820.66 |
| Underwood School District | 34,601.49 |
| City of Washburn | 337,231.15 |
| City of Max | 79,476.13 |
| TOTAL, McLean County Jurisdictions | $ 790,129,42 |
| Coal Severance Tax Distributions:[c] | |
| TOTAL, McLean County Jurisdictions | $ 763,679.39 |
| Coal Conversion Tax Distributions:[c] | |
| TOTAL, McLean County Jurisdictions | $ 287,329.94 |
| TOTAL, Grants, Loans, and Tax Distribution | $7,217,924.46 |

[a]Coal Development Impact Office, **1979-81 Biennium Legislative Report, December 4, 1980.** (Bismarck: Coal Development Impact Office, 1980.)

[b]State Land Department, "Coal Severance Tax Trust," (Bismarck: State Land Department, 1981).

[c]North Dakota, Office of the Tax Commissioner, Unpublished worksheets, (Bismarck: Office of the State Tax Commissioner, 1981).

Economic activity was stimulated by the influx of project workers and their families. This influx led to increased sales and employment in the trade and service sectors of the local economy. Substantial employment growth occurred during the period 1974-1977 in the following local service sectors: wholesale and retail trade (22 percent); finance, insurance, and real estate

(26 percent), and services (23 percent). Additional employment growth occurred between 1977 and 1979 in the finance, insurance, and real estate sector (14.9 percent) and in the services sector (13.7 percent). (Changes in employment in wholesale and retail trade during 1977-1979 cannot be determined from the data, however, because of disclosure limitations (8).)

Construction of the Coal Creek Station provided a substantial stimulus for the expansion of trade and service facilities in the impact area. Several new businesses were established in Washburn and Underwood during the project construction period, and many local leaders cited the construction stimulus to the local economy as one of the major factors contributing to the growth. The consensus, however, was that most major consumer purchases were made from Bismarck and Mandan establishments with local firms filling largely a convenience function. Most of the new or expanded facilities were operated by local people or individuals native to the area who had returned to the area in response to the new opportunities.

Public service needs also increased as a result of construction of the Coal Creek Station. Population growth led to increased demands on a variety of public services and facilities, including schools, housing, water and sewer, public safety, transportation, and social services.

Large increases in school enrollment in the Washburn and Underwood School Districts during the period 1975-1979 can be attributed directly to construction of the Coal Creek Station. Both of these districts built additions to their schools to accommodate enrollment increases. Without the project, their enrollments were expected to decrease about 10 percent between 1975 and 1979. With the project, the Washburn District's enrollment increased 46 percent and the Underwood District's enrollment increased 40 percent. Not every school district in the impact area experienced enrollment increases, however. The Turtle Lake-Mercer District's enrollment decreased by 7 percent (suggesting that project-related enrollment increases were not sufficient to offset the baseline trend of declining enrollment).

The demand for housing in McLean County has fluctuated with employment at the Coal Creek Station. Until the mid-1970s, housing demand in the county was declining with the population. By 1975, the year construction began on Coal Creek, demand for housing in McLean County had begun to rise. This upward trend continued and finally peaked in 1978, the year of peak employment at Coal Creek. Housing demand later tapered off and began to stabilize as the project neared completion. With the construction work force gone, demand is primarily for conventional single-family homes.

The types of housing utilized by the Coal Creek construction work force were examined in the work force survey conducted in 1976. The survey indicated that the work force made substantial use of four types of housing: single-family houses (17 percent), apartments (21 percent), mobile homes (30 percent), and other temporary quarters (32 percent).

Housing prices in McLean County increased considerably during the Coal Creek construction period. While much of this increase has been attributed to the project, it should be remembered that this period was one of rapidly escalating housing prices nationwide. Charges for rental units reportedly tripled during the Coal Creek construction period, and prices of single-family homes doubled, ranging from $45,000 to $85,000, but averaging $50,000. Rising housing costs have been a problem for the elderly and other low-income individuals (primarily predevelopment residents of the area), and low-income rental units have recently been built in some communities.

In addition to increased demands for schools and housing, several communities in the impact area experienced demands for expanded water and sewer systems to accomodate the needs of a growing population. Grants from the state Coal Impact Office were used to partially finance expanded water and sewer systems in Washburn, Underwood, Turtle Lake, and Wilton.

Public safety was another area affected by the population growth in McLean County. The McLean County Sheriff's Department is responsible for public safety. It not only serves the rural areas of the county but also provides law enforcement services by contract to all the communities. In addition, from 1975 to mid-1979, the Sheriff's Department was responsbile for security at the Coal Creek site under contract with UPA/CPA. The biggest increases were in the number of people logged into jail (315.6 percent), in civil services (92.6 percent). and in arrests (89.5 percent), including juvenile offenses. Accidents investigated went up 51 percent, while miles traveled rose 48 percent and offenses reported (complaints) increased 16 percent. (The Sheriff's Department indicated that county judicial policies in effect during 1978 and 1979 placed increased emphasis on mandatory jail sentences for a number of offenses and that this policy change increased the number of persons jailed.)

The most noticeable impact of the Coal Creek project on local law enforcement services resulted from the substantial increase in traffic on U.S. Highway 83, the principal access route to the site from Bismarck and Minot. The Sheriff's Department added additional officers and vehicles to more effectively control the increased traffic and to cope with other demands for increased services. The department staff increased from 13 in 1974 to 23 in 1979 and 25 in 1980, and then dropped to 23 in 1981.

A major transportation problem for the county during the period of project construction was deterioration of the county road system. Movement of large trucks and other heavy equipment on roads near the plant and mine sites caused substantial damage to these road segments. In addition, trucks hauling gravel to the site from various locations in the county contributed to in-

creased road repair requirements. During the early years of project construction, the county commissioners viewed the road situation as their most serious impact problem and believed that the developers, the state, and the federal government were all ignoring the problem (1). By mid-1981, however, these problems had been largely resolved through repairs made by UPA/CPA and the Falkirk Mine and through grants by the state Coal Impact Office.

The final public service need to be discussed, social services, was difficult to assess. Few clear trends emerged in service utilization, except in the Child Abuse and Neglect Program. The number of such cases reported in McLean County increased from nine in fiscal year (FY) 1975-76 to 31 in FY 1980-81. Further examination of child abuse reports indicates that much larger increases in such cases have been observed in McLean and Mercer Counties than in other nearby counties and that the rates of such cases per 1,000 population in FY 1980-81 were also greater in McLean and Mercer Counties. State Social Service Board personnel responsible for this program expressed the opinion that part of the increase could be attributed to the effects of power plant development. In particular, feelings of isolation experienced by some new residents and economic stress imposed on some existing residents by project-induced increases in living costs were believed to be contributing factors.

When interviewed in 1979, the director of the McLean County Social Services Department indicated that, while some increases in social service case loads could be attributed to power plant development, the most severe problem for this department came from cuts the federal government made in the funding of Title XX programs. Money from the Coal Impact Office was not available for social service programs (because of specific restrictions incorporated in the enabling legislation).

Among the impacts of energy development most often dramatized in the press and evident in levels of public concern are those involving basic changes in the way of life, in the value systems, and in the forms of interaction in rural areas (4). Three studies were conducted which dealt at least in part with McLean County residents' perceptions and attitudes regarding the effects of resource development (6, 2, 1).

First, in the North Dakota State University study (based on data collected in 1975), the benefits most frequently mentioned were improved employment opportunities, community improvements associated with population growth, and increased business activity. Problems mentioned most frequently included public and community costs, friction between new and old residents, and increased competition for goods and labor. It is interesting to note that almost half (46.4 percent) of the respondents perceived no problems associated with development (6).

Second, in the University of Wyoming study, residents of McLean County perceived development as a source of economic benefits, including employment opportunities, improved incomes, better community services, and increased tax revenues. About two-thirds (66 percent) of McLean County residents believed that economic benefits result from development (2).

McLean County residents also believed that some undesirable social changes, including a less friendly and united community atmosphere and an increase in crime and illegal drugs, are associated with development. Responses of McLean County residents on this topic were more negative in 1977 than in 1976 and also were more negative than responses of residents of the control counties (Wheatland County, Montana, and Kimball County, Nebraska).

McLean County residents were also asked to rank crime problems for their county. The ranking was: (1) narcotics, (2) larceny, (3) vandalism, (4) robbery, and (5) alcohol. Residents of the control counties also named these problems among the top five, and no clear difference is discernable in the rankings of these problems among the three counties (2).

Finally, almost all of the persons interviewed (in 1979) in the Denver Research Institute study indicated that the construction of the Coal Creek Station had a very positive effect on the county (1). The major benefits cited were increased job opportunities and business opportunities for local residents. Many also indicated that public sector facilities had been greatly improved and that such improvements had been possible without placing undue burdens on local taxpayers. One negative effect, mentioned by a high percentage of those contacted, was the impact on the wage structure. There were increased employer-employee strains, and turnover was high due to the much higher wages paid by construction companies. Local government and businesses could not compete on a salary basis. For example, the county engineer noted that because of high turnover he had virtually run a training ground for heavy equipment operators for the mine and power plant. On the other hand, two negative effects which had been identified in earlier studies (conflicts between new and long-term residents and crime problems) were seldom mentioned by persons interviewed in the Denver Research Institute survey. Overall, then, the individuals interviewed felt that growth had been orderly and that most of the long-time residents of the county had welcomed it.

### Projected vs. Actual Impacts

The actual changes in key economic and social indicators were compared with those projected in two impact studies conducted during the early stages of project development (5, 7). This analysis has implications for the accuracy and reliability of several phases of the impact assessment process. In assessing employment impacts, for example, it was evident that the initial estimates of the construction work force required to complete the project were much too low. Work force projections prepared during the early stages of construction estimated there would be a maximum of 980 con-

struction workers in 1978 (7). The actual peak level of the construction work force in 1978 was 2,224. Such a wide discrepancy between estimated and actual work force levels has very serious implications for the overall usefulness of an anticipatory impact assessment (as estimates of other socioeconomic impacts will be too low).

Because the initial work force estimates were low, for example, the net fiscal impacts on McLean County jurisdictions also were underestimated. After adjustment to take the differences in underlying inmigration estimates into account, the methods and assumptions employed in the anticipatory analyses appear to provide a reasonable approximation of the fiscal burdens associated with development. The major shortcoming of both sets of anticipatory fiscal projections was their tendency to underestimate the costs of road maintenance and law enforcement incurred by the county government.

The problems associated with the initial work force estimates were largely alleviated when the developer prepared revised estimates in 1977. An update of all other socioeconomic impact estimates was then prepared using the new information. The need for a system for ongoing monitoring of work force levels and other key project and community indicators and periodic updating of impact estimates is clearly demonstrated.

Projections of other work force characteristics tended to be relatively reliable. The rates of local hiring during both construction and operation phases were consistent with those estimated in the initial impact projections. The construction workers' residential patterns also were relatively close to those projected, particularly as relates to the percentage of relocating workers who lived in McLean County. However, significant discrepancies were found for some communities. There was a tendency for the actual settlement pattern to be somewhat more dispersed than the original projection. The major deficiency of the initial projections appears to be failure to consider Minot as a settlement location. More attention must be given to discerning factors affecting the distribution of impacts.

Observed changes in trade and service sector employment and personal income in McLean County during the Coal Creek construction period appear generally consistent with those projected. .The observed additional trade and service employment in McLean County associated with Coal Creek development during the period 1974-1977 was about 270 jobs. The North Daktoa State University study projected secondary employment for the multicounty region to be 394 jobs for 1977 (7). However, the Regional Environmental Assessment Program underestimated the actual secondary effects, projecting only 156 new indirect jobs in McLean County for 1977 (5).

Evaluation of the assessments of secondary economic effects of the project demonstrates a difficulty inherent in any restrospective impact analysis — the problem of attribution. The essence of this problem is that, while a given change may have occurred in an area during the same period when an energy project was being developed, it may not be appropriate to attribute all of this change to the effects of the project. Further, while attribution problems exist with respect to all impact categories, they are accentuated in the case of secondary economic effects by limitations in the economic data which are readily available for small rural areas.

Projections of populalation effects and public service impacts also appeared to be generally consistent with observed changes. As in the case of impacts discussed earlier, the projections of overall effects, such as population and school enrollment changes for the county, tended to be more accurate than the projections for individual communities. This again suggests the need to give greater attention to factors influencing the distribution of impacts among communities in the impact county or region.

Planners and decision makers should interpret impact projections as general planning guidelines rather than as highly exact forecasts of future conditions, and impact analysts should consider presenting their results in terms of ranges rather than single-value estimates for the various indicators. Again, there needs to be a monitoring of the changes occurring and a periodic updating of the projection throughout the project period.

**Implications**

Although caution must be exercised in generalizing from a single analysis, the information presented in this case study has implications for delineation of the impacts of energy facility construction and operation, evaluation of the assessment process, and design of impact mitigation programs.

The overall impression of the project's effects is one of well-managed growth with little evidence of the "boom town" phenomena often popularly associated with large-scale energy development projects. The management of this growth has not been without strain on local officials and community residents, but the affected communities have adapted effectively to the needs associated with project-related growth. Local residents feel that the project's overall effects have been positive for the area's economy and that these benefits have exceeded project-related costs. At the same time, they affirm the absolute necessity for careful planning and preparation for such projects and for developer and community cooperation in preparing for development impacts.

Comparison of the impacts projected to those actually experienced indicated the impact assessment procedures employed provided reasonable approximations of the changes that occurred. Comparison of the impacts also highlighted some areas for improvement. First, more detailed analysis of the factors affecting the distribution of a project's effects is needed. Second, studies providing information about similar projects in

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their children. This implies a need to provide parents with age-appropriate, non-value laden, factual information on these sensitive topics.

Another suggestion, in terms of target audience, is that parent educators seek out small groups of parents with similar information needs rather than larger audiences which might have a broader range of interests. The data reported indicate that grouping parents by their ages may be a less than satisfactory education method since parents across age groups were interested in similar topics. Large groupings of parents may be an effective and economical method of parent education.

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comparable areas should be pursued. Third, analysts should present their analyses in terms of multiple scenarios and ranges of impacts. Finally, effective impact monitoring and periodic reassessments are needed throughout a project's construction.

Three key aspects of the Coal Creek impact management program were the availability of community-specific impact projections and updates, existence of a mechanism for providing needed front-end financing for community services and facilities, and effective use of county zoning authority to control local growth patterns. Similar mechanisms should be considered in designing impact management programs for future projects.

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