

CHANGES IN THE STABILITY CHARACTERISTICS OF OHIOANS' ATTITUDES TOWARD STRIP MINING, 1970-75¹

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Abstract. In 1970, attitudes of the population of Ohio toward strip mining were sampled. Data from the sample indicated 44% of the population had stable attitudes toward strip mining—i.e., their affective and cognitive attitudinal components were consistent. A majority had negative feelings toward the industry. Unstable attitudes were found in 30% of the population with the majority having negative affective and positive cognitive components. In 1975, another sample of attitudes was taken. These data revealed a consistency of attitudinal components in only 30% of the population, and the proportion of the group with positive feelings toward strip mining was equal to that having negative feelings. Unstable attitudes prevailed in 60% of the sample with the majority again revealing negative affective and positive cognitive components. The latter study reveals striking changes occurred in the characteristics of attitudes of Ohioans toward strip mining over the five-year period

OHIO J. SCI. 79(4): 164, 1979.

There is an increasing demand for coal which will be supplied in greater amounts by strip mining in the future. In Ohio this industry has been subjected periodically to increased requirements for reclamation. The most recent revision of the Ohio reclamation law became effective in April, 1972. In 1970, efforts to have the law revised were frequently reported by the media, and it was a period when there was a high level of concern in the population over the environmental impact of strip mining. This seemed to be an appropriate time to conduct a study to determine the attitudes of Ohioans toward the industry. It appears that those working to increase the amount of regulation and control of the industry in Ohio were doing so when at least one-third of the population of the State had attitudes toward strip mining that were compatible with their efforts (Ray 1975).

During this same period some significant changes were taking place with respect to world energy supplies. In 1971, the first time in more than a decade, domestic petroleum production took a turn downward and as a result the United States intensified its dependence on im-

ported petroleum from Persian Gulf countries. By 1973 these countries, responding to increasing demands, had raised their oil prices by as much as 70% (**Business Week**, 10 November 1973). These actions were soon followed by cutbacks in production by Middle Eastern countries, and subsequently Saudi Arabia, a major producer, declared an oil embargo to the United States (**Time**, 10 November 1973). Each of these actions tended to cause energy shortages in the United States, and with these reductions in petroleum supplies, demands for natural gas and coal as substitute energy sources increased. Thus, 1973 was a time when lines of automobiles waited for gasoline at service stations, and a time when anxieties over sufficient supplies of oil for heating and power production existed. Not since the end of World War II had the American public been faced with the possibility that energy supplies could be in short supply.

By 1975, the energy situation had improved somewhat; it was no longer necessary for the public to wait in lines for gasoline and there was little apparent concern over fuel supplies for the coming winter. The recency of the fuel shortage, however, was having a residual effect upon government agencies, industry, and

¹Manuscript received 2 June 1977 and in revised form 11 December 1978 (#77-44).

the public. Car pools were still encouraged, efforts were being made to improve and expand public mass transportation, and atomic power plant planning and construction was gaining momentum. Under these conditions a second study of the attitudes of the people of Ohio toward strip mining was deemed appropriate. The study was initiated and the field work completed in the summer of 1975.

STUDY METHODS

The area from which the sample population was selected was the same as that chosen for the 1970 study (Ray 1975, fig. 1). The area consists of 4 counties (Coshocton, Richland, Wyandot, and Henry) extending northwesterly from a core group of 3 counties (Harrison, Jefferson, and Belmont) in east central Ohio, and 4 counties (Perry, Pickaway, Greene, and Butler) extending southwesterly from this core. The counties comprising the core group are, historically, along with Muskingum County, the major producers of strip-mined coal in Ohio (Ohio Department of Industrial Relations, 1967-75). These particular counties were selected to introduce a spatial bias into the study population and improve the probability of obtaining a representative sample of the people of Ohio. Further, a random sample of approximately 33% of the townships in each county were used as data collection areas. The locations of these townships in each county are also shown in Ray (1975, fig. 1).

Financial and time constraints made it necessary to reduce the sample size of the 1975 study. Records from the 1970 effort suggested that a sample approximately one-half the size of the one taken for that study would be consistent with these constraints. To determine whether a sample of this size might be representative of the population of Ohio, a random sample of one-

half of the 432 respondents in the 1970 study was selected. Eight variables from this 50% sample were compared with that of the total sample to test the hypothesis that there were no significant differences in the 2 groups. The variables were selected to provide information on attitudes and social and economic characteristics of the two samples. These variables are listed in table 1 along with the results of Chi Square tests for each of them. The non-parametric Chi Square test was used to test the hypothesis because the data were not normally distributed (Ferguson 1959). No significant difference was indicated in these 2 samples for the 8 variables tested. Thus, a sample of 234 respondents was established for the 1975 study. Sample distribution of respondents by townships and counties for 1970 can be found in Ray (1975, table 1). The distribution of the 1975 sample was reduced so that the townships and counties that had 9 respondents in 1970 had 5 in 1975, those with 8 and 7 had 4, and those with 6 had 3 respondents.

Permission to conduct the study was obtained from the sheriff of each county and the most efficient route through the townships from the county seat was determined and followed. An effort was made to interview the person appearing at the door of every second residence along the selected route until the established number of respondents in each township had been interviewed.

The same questionnaire and attitude scale used in the first study (Ray 1975) were employed to assemble data for the second survey. Analysis of selected data from the questionnaire revealed that the 1975 sample possessed a rather broad range of economic and social characteristics. As in the 1970 study, the sample appeared to be as diverse as the area from which it was selected and was assumed to be representative of the population of the State of Ohio.

The Thurstone Paired Comparison Scale used for these studies was originally prepared and

TABLE 1
*Results of a χ^2 test of the difference between the 1970 study population and a random sample of one-half the population using eight variables.**

Variable	Tabled χ^2 Values**	Degrees Freedom	Obtained χ^2 Values
Sex	6.635	1	0.000
Strip Mining Attitude Scale Score	9.210	2	1.051
Reclamation Attitude Scale Score	9.210	2	0.398
Occupational Scale Score	9.210	2	0.223
Social Status Scale Score	9.210	2	3.430
Type of Residence	13.277	4	0.579
Family Size	18.475	7	2.659
Level of Education	21.666	9	7.425

*n = 432 respondents for the 1970 study.

**P < .01.

tested following the procedures outlined by Edwards (1957)—i.e., items were selected and scaled following a mathematical model, and the agreement of the data with the model was verified by procedures incorporated in the scaling process (Ray 1975, Appendix). Scoring was accomplished by assigning each respondent the median of the scale values they endorsed. Thus, respondents were placed at positions on the psychological continuum established by this scale of favorableness toward strip mining.

Attitudes are said to have **affective**, **cognitive**, and **behavioral** components (Mann 1969). The **affective** component is exemplified by a person's feeling toward a concept. The Paired Comparisons Scale is primarily designed to measure the strength and direction of a person's feeling about a concept (Rosenberg *et al* 1960) and has provided the basis for an evaluation of the affective component in these studies.

The **cognitive** component consists of the perceptions, beliefs, and ideas one has about a concept. The term opinion is commonly used as a surrogate for this component. Respondents were asked to state their opinions on strip mining and these were recorded on the questionnaire along with the reasons they were willing to provide in support of their opinions. These opinions represent the cognitive components of attitudes toward strip mining.

Data on the **behavioral** component was not collected for the current study; therefore, an analysis of this factor was impossible. Thus, a comparative analysis was made of only the affective and cognitive attitudinal components toward strip mining in both studies.

ANALYSIS OF DATA

Data describing the affective attitudes of the two study populations toward strip mining show that little difference exists between them in their feeling about the industry (table 2). About 80% of the 1970 population (n=347) had measured negative feelings toward the industry

compared to 73.5% (n=172) of the 1975 population. Those with positive feelings toward the industry in 1970 represented 14.6% of the group (n=63); in 1975 this figure was 17.1% (n=40). Neutral attitudes were measured for 5.1% (n=22) of the group in 1970, and 9.4% (n=22) in 1975. The significance of these small proportional differences between the two samples was examined with a Chi Square test because distributional characteristics of the data required the use of a non-parametric test for significance. The computed value for Chi Square was 1.76, which was considerably lower than the tabled value for Chi Square ($P < 0.01$); and there was no significant difference in the affective attitudinal component of the two populations.

When the cognitive components of the two populations were examined, a quite different situation was found. Whereas the cognitive component of the 1970 population was divided about equally between negative and positive opinions ($\approx 38\%$), this component was quite differently distributed in the 1975 population (table 2). Negative opinions were voiced by 22.6% (n=53) of the group, while 67.9% (n=159) had positive opinions. Also, 9.4% (n=22) of the 1975 group declined to state an opinion as compared to 23.9% (n=103) similarly inclined in the 1970 population. These data were tested to determine if the differences noted were significant and a value of 18.97 for Chi Square was com-

TABLE 2
Comparison of affective and cognitive attitudinal components toward strip mining for coal in Ohio, 1970 and 1975.

Attitudinal Direction	Number Aff. Comp.	% of Total	Number Cog. Comp.	% of Total
1970 Pop. Sample				
Positive	63	14.6	163	37.7
Neutral	22	5.1	103	23.8
Negative	347	80.3	166	38.4
Totals	432	100.0	432	99.9
1975 Pop. Sample				
Positive	40	17.1	159	67.9
Neutral	22	9.4	22	9.4
Negative	172	73.5	53	22.6
Totals	234	100.0	234	99.9

puted. With $df=2$, this value is more than twice the tabled value for this statistic ($P<0.01$), indicating a significant difference in the two populations regarding the cognitive component of their attitudes toward strip mining.

These summaries of the affective and cognitive components of the study groups suggest that there are discrepancies in both components for each population. Data on the affective and cognitive components for each group were tested to determine if the differences noted were significant. The 104 respondents in the 1970 sample and the 22 in the 1975 group who failed to provide cognitive responses were not included in the data for these tests as they produced zero frequency cells in the Chi Square matrix for the 1975 data. The computed values for Chi Square were 36.85 for the 1970 sample and 28.63 for the 1975 sample. These values were far in excess of the tabled values for Chi Square indicating a significant difference in the affective and cognitive attitudinal components in both samples.

When the affective and cognitive components of attitude are consistent, the attitude is in a stable state; when these

components are inconsistent, the attitude is unstable (Rosenberg *et al* 1960). Thus, the discrepancies noted in these components for the 2 sample populations suggest a lack of attitudinal stability toward strip mining in both groups. An organization of the data allowing a comparison of attitudinal stability between the samples is provided in table 3. These data indicate that 44.4% of the 1970 group ($n=192$) were consistent in their feelings and opinions toward strip mining and of this group, 32.6% ($n=141$) revealed a negative set of attitudinal components; 11.1% ($n=48$) had positive components; and 0.7% ($n=3$) had neutral components (See note below table 3). In 1975, consistency in these attitudinal components prevailed in only 30.8% of the population. Of this group of 72 respondents, 15.0% ($n=35$) had a negative set of components, and a comparable 15.8% ($n=37$) had a positive set. There were none with a neutral set of components.

A comparison of the 2 study groups with respect to attitudinal instability (table 3) reveals that in the 1970 population 32.2% ($n=139$) had inconsistencies in their attitudes toward strip mining.

TABLE 3

Comparison of measured attitudes to stated opinions on strip mining for coal in Ohio, 1970 and 1975.

Median Scale Scores	Scale Score Interp.	1970 Population Sample					1975 Population Sample				
		(N=432) Respon.	No. of Stated Opinions			Ratio Opinions to Att.	(N=234) Respon.	No. of Stated Opinions			Ratio Opinions to Att.
			Pos.	Neut.	Neg.			Pos.	Neut.	Neg.	
Attitudes Consistent											
.216	Very Positive	57	47	0	0	.825	38	36	0	0	.947
.434	Positive	6	1	0	0	.167	2	1	0	0	.500
.637	Neutral	22	0	3	0	.136	22	0	0	0	.000
.935	Negative	166	0	0	89	.536	47	0	0	19	.404
1.045	Very Negative	181	0	0	52	.287	125	0	0	16	.128
Totals		432	48*	3*	141*	—	234	37†	0	35†	—
Attitudes Opposite											
.216	Very Positive	57	0	0	6	.105	38	0	0	2	.053
.434	Positive	6	0	0	3	.500	2	0	0	1	.500
.637	Neutral	22	4	0	15	.864	22	7	0	15	1.000
.935	Negative	166	42	0	0	.253	47	24	0	0	.511
1.045	Very Negative	181	69	0	0	.381	125	91	0	0	.728
Totals		432	115**	0	24**	—	234	122††	0	18††	—

*1970 Population: $48+3+141=192$; 44.4% of the sample.

†1975 Population: $37+35=72$; 30.8% of the sample.

**1970 Population: $115+24=139$; 32.2% of the sample.

††1975 Population: $122+18=140$; 59.8% of the sample.

Of these individuals, 25.7% (n=111) had negative feelings toward the industry, but expressed a positive opinion on the concept; 2.1% (n=9) had positive feelings, but expressed negative opinions; and 4.4% (n=19) had neutral feelings, but expressed either positive opinions (n=4) or negative opinions (n=15) toward strip mining. In contrast, inconsistencies existed in 59.8% of the 1975 population. Of the 140 persons in this group, 49.2% (n=115) had negative feelings toward the industry, but expressed a positive opinion on the concept; 1.3% (n=3) had positive feelings, but expressed negative opinions; and 9.4% (n=22) had neutral feelings, but expressed either positive opinions (n=7) or negative opinions (n=15) toward strip mining.

Another dimension of attitudinal instability was evident in both populations because 23.4% of the 1970 population (n=101) had either positive or negative feelings toward strip mining, but refused to state an opinion, *pro* or *con* on the activity (table 4). The 1975 population had only 9.4% (n=22) who refused to state their opinions on strip mining and all of these persons had negative feelings toward the industry. In both popula-

tions this dimension of inconsistency (refusal to offer a cognitive response) suggests the experiences of these persons with strip mining were somewhat different from those of the other two groups in both populations.

CONCLUSIONS

In 1970 there was a high level of activity in Ohio directed toward extending regulatory control over the strip mining industry. At that time a measure of the affective and cognitive components of attitudes toward this industry was taken from a sample population across the State. The study revealed that 44.4% of the sample had stable attitudes toward the industry (32.6% negative, 11.1% positive). There was, however, considerable instability within the sample and this was reflected in an inconsistency in the affective and cognitive attitudinal components of 32.2% of the population. Of the total sample, 25.7% had negative feelings and expressed positive opinions on the industry.

By 1975, significant changes had occurred in the attitudes of the population of Ohio toward strip mining. Stability in attitudes toward the industry was present in only 30.8% of the sample

TABLE 4
Comparison of measured attitudes to neutral opinions on strip mining for coal in Ohio, 1970 and 1975.

Median Scale Scores	Scale Score Interp.	(N=432) Respon.	Neut. Opinions	Ratio Opinions to Att.
1970 Pop. Sample				
.216	Very Positive	57	4	.070
.434	Positive	6	2	.333
.637	Neutral	22	*	*
.935	Negative	166	35	.211
1.045	Very Negative	181	60	.332
Totals		432	101**	—
1975 Pop. Sample				
.216	Very Positive	38	0	.000
.434	Positive	2	0	.000
.637	Neutral	22	0	.000
.935	Negative	47	4	.085
1.045	Very Negative	125	18	.144
Totals		234	22 ⁺	—

*These data are given in table 3.

**1970 Population; 23.4% of the sample.

⁺1975 Population; 9.4% of the sample.

population (15.0% negative, 15.8 positive). Inconsistencies in the affective and cognitive components of the attitudes of the 1975 sample showed that the instability in attitudes toward the industry had also undergone change. This change was evidenced by the fact that 59.8% of the sample group had affective components which were inconsistent with their opinions. Of the total sample, 49.1% had negative feelings and expressed positive opinions on the industry.

The cumulative experiences, both direct and indirect, of the population from 1970 to 1975, have had a measurable effect on the attitudes of the population of Ohio toward strip mining. Over this period the costs of energy in all forms were increasing and difficulty was experienced in acquiring sufficient amounts of it in the required form. There continued to be alterations of landscape, the atmosphere, and water resources related to strip mining and the use of coal. These experiences had varying influences on the level of stability in attitudes of the population of Ohio toward strip mining. Our study has shown a reduced level of stability. The stability level identified was divided about equally between the negative and positive attitudinal dimensions toward strip mining in 1975, whereas in 1970, this stability dimension was decidedly negative.

Significant changes were found in the instability pattern of attitudes toward the industry, as well. The proportion of the population that had negative feelings toward the industry, but could rationalize the existence of the industry in the State to the extent that positive opinions on strip mining could be expressed, nearly doubled during the 5 year period between studies. The instability of attitudes toward strip mining, revealed by those respondents who declined to state opinions on the industry, were found to have changed over the same period in that the proportion of the 1975 population in this category was less than $\frac{1}{2}$ that of the 1970 population.

In summary, a comparison of the feelings of Ohio residents toward strip mining in 1975 and in 1970, revealed a change in a positive direction for the affective com-

ponent of their attitudes, although this change was not statistically significant. In contrast, the distribution of opinions expressed about this activity within the population changed in a striking manner over the 5 year period between studies. Changes in the cognitive component of attitudes in the 1975 sample toward strip mining produced a higher level of attitudinal instability than that found in the 1970 population. Attitudinal instability in the earlier group was found in about $\frac{1}{3}$ of the population with approximately $\frac{1}{4}$ of the group expressing positive opinions about the industry. In 1975, almost 60% of the population had unstable attitudes toward strip mining with approximately $\frac{1}{2}$ of the group expressing positive opinions about this activity.

In time, the feelings and opinions of that part of the population exhibiting instability in their attitudes toward strip mining should move toward a stable condition—i.e., the two attitudinal components will become consistent. It is difficult to say which direction this move will take because attitudes are constantly being modified by the cumulative experiences of each individual in the population. This will only be seen through continued monitoring of the direction in which the attitudes of the people of Ohio are stabilizing toward the strip mining industry.

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