

# **Pennsylvania Residents' Perceptions of Natural Gas Development in the Marcellus Shale: Differences Among Residents in Self Perceived Knowledge and Attitudes**

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# **Pennsylvania Residents' Perceptions of Natural Gas Development in the Marcellus Shale:**

## **Differences Among Residents in Self Perceived Knowledge and Attitudes**

### ***Introduction***

This report utilizes data from a 2009-2010 survey of 1461 residents in the Marcellus Shale region of Pennsylvania dealing with their knowledge and perceptions concerning the developing natural gas industry in the Commonwealth. The study was conducted through the collaborative efforts of researchers from The Pennsylvania State University, Cornell University, and The Institute for Public Policy & Economic Development at Wilkes University. Previous reports providing information on the sample and general descriptive findings can be found at [www.institutepa.org](http://www.institutepa.org).

This report focuses on how self-perceived knowledge and attitudes differ in regard to selected personal and social characteristics of the respondents. The survey was undertaken during the early stages of the Marcellus gas industry's development in Pennsylvania to obtain baseline information from which changes in residents' views across time could be monitored through subsequent surveys. As a result, the findings addressing public knowledge and attitudes may not reflect the current situation. However, information on the social correlates of these respondents' views provides insight into the nature and possible causes of variation among residents and sets the stage for additional inquiry.

### ***Knowledge***

The questionnaire asked respondents to rate their knowledge of each of the following areas:

- a. Economic impacts of the natural gas industry
- b. Social impacts of natural gas well development on communities
- c. Effects of gas drilling on the natural environment (streams, rivers, fish, wildlife)
- d. Implications of natural gas drilling for water quality and quantity

Response categories were: "none/almost none," "very little," "some, but not much," "A good bit," and "A great deal." For this analysis, the number of categories was reduced to three: "none/almost none and very little," "some, but not much," and "a good bit/a great deal."

**Personal Characteristics Related to Knowledge**

Although a sizable proportion of *all* survey respondents reported they knew “very little or nothing” about the economic, social and environmental impacts of gas well drilling, there were differences in the levels of knowledge depending upon the person’s gender, age, educational level, participation in community organizations, landownership and whether or not the individual had signed a gas company lease.

- Women were more likely than men to report they knew “little or nothing” about economic impacts (54% vs. 36%), social impacts (56% vs. 39%) or environmental impacts (49% vs. 31%), and water impacts (52% vs. 32%). (Table 1).

**Table 1. GENDER Differences in reported knowledge of ECONOMIC, SOCIAL and ENVIRONMENTAL IMPACTS and the implications for WATER quality and quantity of Marcellus Shale gas drilling.**

Reported Knowledge of Economic, Social, Environmental & Water Impacts	Gender	
	Male (N=788) <sup>a</sup>	Female (N=642)
	%	%
Knowledge of Economic Impacts		
None/ Very Little	35.6	53.5
Some, but not much	30.3	26.0
A good bit/A great deal	34.1	20.5
Knowledge of Social Impacts		
None/ Very Little	38.6	55.5
Some, but not much	33.6	27.5
A good bit/A great deal	27.8	16.9
Knowledge of Environmental Impacts		
None/ Very Little	30.7	48.5
Some, but not much	30.3	24.9
A good bit/A great deal	39.0	26.6
Knowledge of Water Implications		
None/ Very Little	32.3	51.7
Some, but not much	30.7	23.5
A good bit/A great deal	41.1	27.4

<sup>a</sup> Number of cases varies due to missing data.

- Persons 65 and older were the most likely to report they knew “little or nothing” about the economic (53%), social (53%), environmental (43%), and water (47%) impacts of drilling. Younger people were somewhat less likely to feel they knew “very little or nothing” about these effects. (Table 2).

**Table 2. AGE Differences in reported knowledge of ECONOMIC, SOCIAL, and ENVIRONMENTAL IMPACTS and the implications for WATER quality and quantity of Marcellus Shale gas drilling.**

Reported Knowledge of Economic, Social, Environmental & Water Impacts	Age		
	Less than 45 years (N=285) <sup>a</sup>	45-64 years (N=676)	65 years and over (N=437)
	%		
Knowledge of Economic Impacts			
None/ Very Little	42.5	38.5	52.5
Some, but not much	27.7	30.1	26.7
A good bit/A great deal	29.8	31.4	20.8
Knowledge of Social Impacts			
None/ Very Little	47.2	42.0	53.0
Some, but not much	27.8	33.5	27.8
A good bit/A great deal	25.0	24.5	19.2
Knowledge of Environmental Impacts			
None/ Very Little	40.5	35.0	42.9
Some, but not much	23.9	29.3	28.0
A good bit/A great deal	35.6	35.7	29.1
Knowledge of Water Implications			
None/ Very Little	43.0	36.4	47.0
Some, but not much	27.5	28.6	25.1
A good bit/A great deal	29.6	35.0	27.9

<sup>a</sup> Number of cases varies due to missing data.

- As educational level increased, from high school graduation or less, to some college, to four-year college graduate, the percentages reporting “very little or no” knowledge decreased. For economic impacts this decrease was from 57% to 40%, to 33%. For knowledge of social

impacts, these figures were 58%, 43%, and 38%; for environmental impacts, the percentages were 49%, 38%, and 29%, respectively; and for impacts on water, 51%, 39%, 33%. (Table 3).

**Table 3. EDUCATION Differences in reported knowledge of ECONOMIC, SOCIAL, and ENVIRONMENTAL IMPACTS and the implications for WATER quality and quantity of Marcellus Shale gas drilling.**

Reported Knowledge of Economic, Social, Environmental & Water Impacts	Education		
	High School or Less (N=503) <sup>a</sup>	Some College (N=478)	4-year college graduate (N=441)
	%		
Knowledge of Economic Impacts			
None/ Very Little	57.4	39.9	32.5
Some, but not much	25.3	33.3	26.3
A good bit/A great deal	17.3	26.8	41.2
Knowledge of Social Impacts			
None/ Very Little	57.6	42.6	37.8
Some, but not much	27.3	34.7	30.3
A good bit/A great deal	15.1	22.7	31.9
Knowledge of Environmental Impacts			
None/ Very Little	48.6	37.6	29.0
Some, but not much	26.4	29.1	28.1
A good bit/A great deal	25.0	33.3	42.9
Knowledge of Water Implications			
None/ Very Little	50.5	38.6	32.7
Some, but not much	26.2	29.7	26.8
A good bit/A great deal	23.3	31.1	40.5

<sup>a</sup> Number of cases varies due to missing data.

- Length of time the individual had lived in the community was not related to reported knowledge levels.
- Participation in community organizations was positively related to the amount of knowledge residents reported in regard to potential impacts of the gas industry. Among those who belonged to no organizations 56% reported “little or no” knowledge about economic

impacts, 58% indicated they knew little or nothing about social impacts, 47% knew little or nothing about environmental impacts, and 50% knew “little or nothing” about the implications of drilling for water quality. For those who belonged to one to three organizations, the corresponding percentages were 38%, 41%, 36%, and 39%. For residents belonging to 4 or more community organizations 30%, 34%, 27% and 28% reported they knew “little or nothing” respectively about the economic, social, environmental, and water implications of drilling. (Table 4).

**Table 4. PARTICIPATION IN COMMUNITY ORGANIZATIONS Differences in reported knowledge of the ECONOMIC, SOCIAL, and ENVIRONMENTAL IMPACTS and the implications for WATER quality and quantity of Marcellus Shale gas drilling.**

Reported Knowledge of Economic, Social, Environmental & Water Impacts	Participation in Community Organizations		
	None (N=602) <sup>a</sup>	1-3 orgs (N=450)	4 or more orgs (N=368)
	%		
Knowledge of Economic Impacts			
None/ Very Little	56.0	37.8	29.8
Some, but not much	24.2	32.0	31.7
A good bit/A great deal	19.8	30.2	38.5
Knowledge of Social Impacts			
None/ Very Little	57.5	41.4	33.5
Some, but not much	27.5	33.0	33.8
A good bit/A great deal	15.1	25.6	32.7
Knowledge of Environmental Impacts			
None/ Very Little	47.3	35.7	27.3
Some, but not much	29.5	26.6	26.8
A good bit/A great deal	23.2	37.7	45.9
Knowledge of Water Implications			
None/ Very Little	49.9	39.1	27.9
Some, but not much	27.7	28.2	26.8
A good bit/A great deal	22.4	32.7	45.2

<sup>a</sup> Number of cases varies due to missing data.

- Land ownership was associated with increased reported knowledge. As the acres owned increased, the proportions of residents reporting they had “little or no” knowledge declined. Among those who owned no land 52% indicated they knew little or nothing about economic impacts, 54% said they knew little or nothing about social impacts, 45% reported they knew little or nothing about environmental impacts, and 49% indicated they knew little or nothing about the impacts of drilling on water. These figures declined with increasing acreage owned. Among those owning 50 or more acres only 19%, 26%, 17%, and 18% respectively reported knowing little or nothing about these effects. (Table 5).

**Table 5. LAND OWNERSHIP Differences in reported knowledge of ECONOMIC, SOCIAL, and ENVIRONMENTAL IMPACTS and the implications for WATER quality and quantity of Marcellus Shale gas drilling.**

Reported Knowledge of Economic, Social, Environmental & Water Impacts	Land Ownership			
	Does not own (N=802) <sup>a</sup>	Owns less than 5 acres (N=334)	Owns 5-49 acres (N=158)	Owns 50 acres or more (N=109)
	%			
Knowledge of Economic Impacts				
None/ Very Little	51.8	36.1	33.5	19.4
Some, but not much	27.5	35.8	24.1	23.1
A good bit/A great deal	20.7	28.2	42.4	57.4
Knowledge of Social Impacts				
None/ Very Little	54.0	40.7	32.2	25.5
Some, but not much	28.7	35.6	30.4	34.9
A good bit/A great deal	17.3	23.7	37.3	39.6
Knowledge of Environmental Impacts				
None/ Very Little	45.3	32.4	31.6	16.7
Some, but not much	28.8	28.2	20.9	32.4
A good bit/A great deal	25.9	39.4	47.5	50.9
Knowledge of Water Implications				
None/ Very Little	48.6	33.1	31.6	17.8
Some, but not much	27.7	28.6	20.9	36.4
A good bit/A great deal	23.5	38.3	47.5	45.8

<sup>a</sup> Number of cases varies due to missing data.



- Persons who had not signed a gas lease were more likely than those who had done so to report they knew “little or nothing” about economic impacts (45% vs. 27%), social impacts (48% vs. 30%), environmental impacts (39% vs. 25%), and water quality impacts (42% vs. 26%). (Table 6).

**Table 6. GAS LEASE Differences in reported knowledge of ECONOMIC, SOCIAL, and ENVIRONMENTAL IMPACTS and the implications for WATER quality and quantity of Marcellus Shale gas drilling.**

Reported Knowledge of Economic, Social, Environmental & Water Impacts	Gas Lease	
	No (N=1257) <sup>a</sup>	Yes (N=147)
	%	%
Knowledge of Economic Impacts		
None/ Very Little	44.8	26.7
Some, but not much	30.0	19.9
A good bit/A great deal	25.2	53.4
Knowledge of Social Impacts		
None/ Very Little	47.5	30.1
Some, but not much	31.3	28.8
A good bit/A great deal	21.2	41.1
Knowledge of Environmental Impacts		
None/ Very Little	39.3	24.8
Some, but not much	28.2	26.2
A good bit/A great deal	32.5	49.0
Knowledge of Water Implications		
None/ Very Little	41.8	26.2
Some, but not much	28.1	23.4
A good bit/A great deal	30.1	50.4

<sup>a</sup> Number of cases varies due to missing data.

### ***County Characteristics Related to Knowledge***

Characteristics of the counties in which respondents lived provided some measures of the local social context that were expected to be associated with their knowledge levels. However, there were no significant differences in reported knowledge levels of economic, social, or environmental impacts according to the county's unemployment rate, median family income, or the percentage of the population with 4-year college degrees. Of the county-level characteristics assessed, only the number of wells and population density (number of persons per square mile) for the county were found to be related to any of the measures of residents' reported knowledge

- Among those living in counties with fewer than 100 wells, 45% reported they knew "little or nothing" about economic impacts, compared to 35% of those in counties with 100 wells or more. For social impact knowledge, the corresponding percentages were 48% and 37%; for environmental impact, these percentages were 40% vs. 30%, and for water quality impacts 42% of those in counties with fewer than 100 wells and 32% in counties with 100 or more wells, 32% reported they knew "very little or nothing."
- There was a tendency for persons living in areas of higher population density to have lower reported knowledge levels in regard to economic, social, environmental, and water quality impacts than did those in areas with fewer persons per square mile.

### ***Overall Opposition and Support***

Respondents were asked: "Considering everything, how do you feel about natural gas extraction from the Marcellus Shale region?" Answer categories were: "strongly oppose," "somewhat oppose," "neither oppose nor support," "somewhat support," and "strongly support." For this analysis, these categories were reduced to three – "oppose," "neither oppose nor support," and "support." Overall, residents were more than twice as likely to support gas extraction (47%) as to oppose it (19%), with just over a third (34%) indicating they were neither supportive nor opposed.

**Knowledge and Support/Opposition**

The lower the perceived knowledge of economic, social, environmental or water impacts, the more likely residents were to respond they “neither opposed nor supported,” extraction, implying they had no opinion or were ambivalent about Marcellus drilling. (Table 7).

**Table 7. Differences in overall OPPOSITION/ SUPPORT for natural gas extraction From the Marcellus Shale, by reported knowledge of ECONOMIC, SOCIAL, and ENVIRONMENTAL IMPACTS and the implications for WATER quality and quantity, INCLUDING those who neither oppose nor support.**

Reported Knowledge of Economic, Social, Environmental & Water Impacts	Opposition/Support			Total %	Total number of cases <sup>a</sup>
	Opposed	Neither oppose nor support	Support		
	%	%	%		
Knowledge of Economic Impacts					
None/ Very Little	15.6	49.5	34.9	100.0	590
Some, but not much	20.0	31.7	48.3	100.0	404
A good bit/A great deal	21.3	14.0	64.7	100.0	394
Knowledge of Social Impacts					
None/ Very Little	14.8	47.8	37.4	100.0	626
Some, but not much	17.8	29.1	53.1	100.0	433
A good bit/A great deal	27.1	14.6	58.3	100.0	321
Knowledge of Environmental Impacts					
None/ Very Little	14.0	47.9	38.1	100.0	520
Some, but not much	12.9	33.5	53.6	100.0	394
A good bit/A great deal	28.4	19.7	51.9	100.0	472
Knowledge of Water Implications					
None/ Very Little	13.6	48.1	38.3	100.0	553
Some, but not much	14.2	30.4	55.4	100.0	388
A good bit/A great deal	28.6	20.3	51.1	100.0	444

<sup>a</sup> Number of cases differs from the total due to missing data.

- 50% who reported they had little or no knowledge about economic impacts, reported they neither opposed nor supported extraction. Among those who felt they had a good bit/great deal of knowledge, that figure declined to 14%.
- 48% of those with little or no knowledge of social impacts compared to 15% of those with a good bit/great deal of knowledge had no opinion or were ambivalent about extraction.
- 48% of those with little or no knowledge of environmental impacts and those with little or no knowledge of its implications for water resources indicated they neither opposed nor supported drilling; 20% of those with at least a good bit of knowledge responded in this way.
- Regardless of reported knowledge levels of economic, social, environmental and water impacts, proportionately more residents expressed “support” for developing the industry than opposed it.

Among those who *did* state an opinion (i.e., answered either “supported” on ‘opposed”) there was no statistical relationship between respondents’ reported knowledge levels of economic or social impacts and their likelihood of supporting or opposing the industry. Those indicating they had “a good bit or a great deal” of knowledge about environmental and water quality/quantity impacts were somewhat more likely than those reporting “little or no” such knowledge to oppose drilling. (Table 8).

**Table 8. Differences in overall OPPOSITION/ SUPPORT for natural gas extraction from the Marcellus Shale, by reported knowledge of ENVIRONMENTAL IMPACTS and the implications for WATER quality and quantity, EXCLUDING those who neither oppose nor support extraction**

Reported Knowledge of Economic, Social, Environmental & Water Impacts	Opposition/Support		Total	Total number of cases <sup>a</sup>
	Oppose	Support		
	%	%	%	
Knowledge of Environmental Impacts				
None/ Very Little	26.9	73.1	100.0	271
Some, but not much	19.5	80.5	100.0	262
A good bit/A great deal	35.4	64.6	100.0	379
Knowledge of Water Implications				
None/ Very Little	26.1	73.9	100.0	287
Some, but not much	20.4	79.6	100.0	270
A good bit/A great deal	35.9	64.1	100.0	354

<sup>a</sup> Number of cases differs from the total due to missing data.

- 35% of who reported they had “a good bit or a great deal” of knowledge of environmental impact were more likely to oppose development of the gas industry, than were those with “no or very little” knowledge (27%).
- 36% of those indicating they had “a good bit or a great deal” of knowledge of the implications of drilling for water quality and quantity opposed drilling; 26% of those with “no or very little” knowledge were opposed.

***Personal Characteristics and Support/Opposition***

There were differences in residents’ attitude toward drilling depending upon the gender, age, education, participation in community organizations, whether they owned land in the region, and whether he/she had signed a lease. (Table 9).

**Table 9. Differences in overall OPPOSITION/SUPPORT for natural gas extraction From the Marcellus Shale, by personal characteristics of respondents.**

Personal characteristics of respondents	Opposition/Support			Total %	Total number of cases <sup>a</sup>
	Oppose %	Neither oppose nor support %	Support %		
Gender					
Male	15.6	27.1	57.3	100.0	774
Female	21.8	42.9	35.3	100.0	614
Age					
Less than 45 years	21.4	34.7	43.9	100.0	280
45-64 years	19.6	32.0	48.4	100.0	665
65 years and over	13.7	37.8	48.5	100.0	410
Education					
High school or less	14.8	41.9	43.3	100.0	473
Some college	15.6	36.0	48.4	100.0	469
4-year college graduate	24.9	23.8	51.3	100.0	437
Participation in community organizations					
None	17.2	41.6	41.2	100.0	577
1-3 organizations	19.5	31.4	49.1	100.0	440
4 or more organizations	19.0	25.1	55.9	100.0	358
Land ownership					
Does not own land	17.9	42.9	39.2	100.0	765
Owns less than 5 acres	24.7	26.8	48.5	100.0	328
Owns 5-49 acres	12.5	20.4	67.1	100.0	152
Owns 50 acres or more	9.3	14.8	75.9	100.0	108
Signed a gas lease					
No	20.1	36.6	43.3	100.0	1211
Yes	6.2	13.9	79.9	100.0	144

<sup>a</sup> Number of cases differs from the total due to missing data.

- Women were more likely than men to answer they “neither opposed nor supported” natural gas extraction (43% vs. 27%). Although both men and women were more likely to support than oppose drilling, men were more likely to express support than were women (57% vs. 35%).
- Residents 65 years of age and older were less likely than their younger counterparts to oppose drilling, with 14% of residents 65 years and over opposed, compared with 20% of those between 45 and 64, and 21% of those younger than 45 years of age.

- As educational level increased, the percentages of neutral or undecided (i.e. neither oppose nor support”) responses declined from 42% for those with no more than a high school education to 24% of those with a college degree. Although the overall percentages of both “oppose” and “support” answers increased, with increasing education, when only those persons who took a position (either “oppose” or “support”) were considered, “support” responses were lower for college graduates than for those with less education. (Data not shown).
- Residents who participated in four or more community organizations were least likely to indicate they “neither opposed nor supported” drilling, with 42% of those who belonged to no organizations giving this neutral response, and just 25% of those participating in four or more community organizations. The percentage supporting development of the industry increased slightly with increasing levels of participation.
- The amount of land owned in the regions was strongly positively related to support for drilling. Overall, while 39% of those owning no land were supportive, that percentage increased to 49% for those who owned less than 5 acres, to 67% of residents with 5-49 acres, and to 76% for those with 50 or more acres.
- Of those who had already signed a lease (only about 10% of the respondents had done so), 80% reported they supported natural gas extraction; 43% of those who had not signed a lease did so.

### ***County Characteristics and Support/Opposition***

County unemployment rates and population density of the county of residence were related to respondent’s attitudes toward Marcellus gas drilling, but the number of wells in the county at the time of the survey, median family income, and the percentage of the population with bachelor’s degrees were not statistically related to residents’ views.

- Support for natural gas extraction increased from 40% in counties with unemployment rates of less than six percent to 54% in counties with unemployment rates of seven percent or more.
- Counties with relatively low population densities were most likely to express support for gas drilling, with the percentage of “support” responses decreasing with increasing population density.

## ***Summary and Conclusions***

This analysis explored the social bases of variation in the views of people living in the Marcellus Shale region of Pennsylvania concerning how much they felt they knew about possible impacts of drilling for natural gas in the area and their opposition to or support for developing the industry. There were differences in the reported knowledge of the residents, depending upon the individual's personal characteristics and, to a lesser extent, on the characteristics of the counties in which they lived. In general, men, the more highly educated, those who participated in community organizations, landowners, those who had signed a lease with a gas company reported higher levels of knowledge than did women, those with less education, and those who did not participate in community organizations, those who did not own land, and had not signed a gas company lease. Residents of counties with a greater number of wells operating, and those living in counties with low population density were slightly more likely than their opposites to report they had at least some knowledge of the economic, social, environmental, and water quality impacts of natural gas development in the region.

There was also variation among residents in their stated opposition or support of developing the gas industry in the region. Almost half of the residents who professed to have little or no knowledge about the economic, social, environmental, and water quality/quantity impacts responded they "neither opposed nor supported" drilling. Perceived knowledge levels were related to a tendency for respondents to have made a decision on their support or opposition for drilling. Among those who did express an opinion, perceived knowledge of environmental and of water impacts were both positively associated with the tendency to oppose drilling. Men, older residents, those with more formal schooling, participants in community organizations, landowners, those who had already signed a lease, residents of counties with high unemployment rates, and counties with low population densities were more likely to express support than were others.

Information on these *differences* in knowledge and opinions of residents provides baseline data from which educators, government officials, community leaders, and other stakeholders can take action as they seek to inform the public and encourage citizen participation in community efforts related to the developing industry. However, in underscoring the social bases of diversity, it is important that overarching findings from the study are also recognized.



Regardless of the personal attributes of the residents or the characteristics of their counties of residence, most people living in the region reported low levels of knowledge concerning the possible implications of Marcellus development, and a third of the sample members reported they “neither opposed nor supported’ drilling. These observations suggest that, at the time of the survey, for many people, opinions regarding development of the natural gas industry in the Marcellus Shale were not yet formed. During the intervening time since the study was carried out, knowledge levels may have increased due to enhanced media coverage and political actions. However, the extent and nature of residents’ responses to this information is not known. More current data on extent of public knowledge of these issues is needed.

A second general observation from the current analysis concerns the extent to which residents reported they were opposed to or supportive of gas drilling. Although the percentages supporting and opposing the development of the gas industry in the region varied by the personal characteristics of the individuals and the unemployment rates and population densities of the counties, most respondents “supported” drilling. Indeed, in the total sample, 47% of the respondents indicated “support” while only 19% were “opposed” and, in virtually every category of the personal and county characteristics analyzed in the current report, the percentage of “support” answers outnumbered “oppose” replies by more than two-to-one. Nevertheless, it would be premature to assert that public opinion today is overwhelmingly in favor of drilling. Not only did a third of the respondents report they were “neither opposed nor supportive” and many responded to the question while admittedly knowing little or nothing about the issues involved, but the certainty with which residents held their views was not addressed in this analysis. It should be recalled that, responses were classified as “support” and “oppose,” combining the two answer categories of “strongly support” and “somewhat support”” as well as the categories of “strongly oppose” and “somewhat oppose”. Sixty-four percent of those classified as supportive, and the same percentage of those designated as opposing drilling reported they were only “somewhat supportive” or “somewhat opposed,” suggesting there were reservations in the views of these respondents. Additional assessments of residents’ perceptions across time may find changes in support or opposition to Marcellus drilling as the industry continues to develop. This study examined the perception and attitudes of citizens during the early stages of shale drilling, and represents a baseline for future research focused on charting changes across time. The

gas industry in Pennsylvania is expanding rapidly. In such a setting, it is imperative that public views on these issues be continuously monitored, called into account at all levels of government, and utilized by educators seeking to inform residents of the nature of these impacts. Such knowledge can contribute to the ability of residents, public officials, and community leaders to understand and respond in meaningful ways to these changing circumstances.