Final Research Report

PERCEPTIONS OF OIL AND NATURAL GAS DEVELOPMENT IN THE EAGLE FORD SHALE: A SUMMARY OF FINDINGS FROM A 2015 SURVEY

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PURPOSE

Between March 2015 and May 2015, a random sample of residents and absentee landowners from two counties in Texas's Eagle Ford Shale region was contacted and asked to participate in a study on public perceptions of oil and natural gas development in the region.

Respondents were asked to provide information on their/the:

- Perceptions of the oil and gas industry;
- Perceptions of potentially problematic issues associated with oil and gas development;
- Trust in selected groups/organizations as sources of information about the positive and negative impacts of oil and/or natural gas development;
- Satisfaction with the performance of the oil and natural gas industry;
- Actions which may or may not have been taken in response to the exploration and production of oil and natural gas;
- Satisfaction with communication involving oil and gas industry activities;
- Management decisions related to oil and gas development occurring in/near respondent's communities;
- Efforts by federal and state agencies and regional and local groups/organizations to include local residents' input into decisions related to oil and gas industry development; and
- Hydraulic fracturing and the management, disposal, and reuse of frac flowback waters.

This report summarizes the findings from the survey.

DATA COLLECTION

Following a modified tailored design method (Dillman, Smyth, and Christian 2014), the data for this study were gathered using mail survey techniques. First, in February 2015, an informational letter was mailed to a random sample of 525 residents and absentee landowners in La Salle County, Texas, and 525 residents/absentee landowners in Karnes County, Texas. This letter informed sampled individuals that their household was randomly selected for participation in an upcoming study about public perceptions of oil and natural gas development in the Eagle Ford Shale region of Texas. Three sampled individuals from La Salle County and six sampled individuals from Karnes County contacted the researchers and requested not to participate in the study. These nine sampled individuals were not replaced. Hence, the final sample size was reduced to 1,041.

In March 2015, a survey questionnaire was mailed to the sampled individuals. To obtain a representative sample of individuals within residences, a response from the adult who most recently had his/her birthday was requested in the cover letter. The survey questionnaire, organized as a self-completion booklet, contained 39 questions and required approximately 50 minutes to complete. After the initial survey mailing and two follow-up mailings during April and May of 2015, a total of 115 questionnaires were returned (44 from La Salle County; 71 from Karnes County).[1]

[1] For detailed information on the characteristics of the sampled respondents from Karnes County and La Salle County, see Theodori and Uzunian (2015a, 2015b).

FINDINGS

Perception of the Oil and Natural Gas Industry

Building upon earlier research from the Barnett Shale (Theodori 2012, 2013) and energy-producing counties in Texas (Theodori and Lyke-Ho-Gland 2008), perception of the oil and natural gas industry was assessed using a series of Likert-type survey items. Respondents were asked to indicate whether they "strongly disagreed," "mildly disagreed," were "unsure," "mildly agreed," or "strongly agreed" with 13 attitudinal statements. Maximum likelihood factor analysis using oblique rotation was conducted on these perceptual items to determine what, if any, underlying structures existed among them (Costello and Osborne 2005). The analysis indicated a two-factor solution using 10 of the items was most appropriate.

After rotation, three of the items loaded on Factor 1 (see Table 1). These items addressed perceived economic/service-related aspects of oil and natural gas development in the Eagle Ford Shale. Seven of the 10 items loaded on Factor 2. These measures addressed the perceived social/environmental aspects of the oil and natural gas industry. Factor 1 accounted for 22.63 percent of the total variance and Factor 2 accounted for 23.54 percent of the total variance.

Table 1
Factor Loadings for Perception of the Oil and Natural Gas Industry Items

	Loading
Factor 1: Economic and service-related aspects of the oil and natural gas industry	
The oil and natural gas industry is important to the local economy.	-0.51
Because industry has to be competitive, it is unfair to expect oil and gas companies to tell the public about their plans.	-0.34
All in all, the benefits of oil and gas development in the Eagle Ford Shale are greater than the costs.	-0.99
Factor 2: Social and environmental aspects of the natural gas industry	
Not enough information concerning oil and gas development in the Eagle Ford Shale is being made available to the general public.	0.55
Even when carefully controlled, oil and gas development is likely to upset the quality of life in a local area.	0.58
The oil and gas industry must adopt and use more environmentally-friendly drilling practices in the Eagle Ford Shale.	0.62
Too little attention is being paid to the social costs of oil and gas development in the Eagle Ford Shale.	0.82
The oil and gas has little interest in our natural environment.	0.77
Oil and gas companies in the Eagle Ford Shale will do only what's required by law.	0.49
Oil and gas industry operators in the Eagle ford Shale are too politically powerful.	0.74

For purposes of analysis, response categories were coded so that higher values reflected more negative views of the oil and gas industry. The items addressing the social/environmental aspects of the oil and gas industry were coded as 1 = strongly disagree, 2 = mildly disagree, 3 = unsure, 4 = mildly agree, and 5 = strongly agree. The items addressing the economic/service-related aspects of the oil and gas industry were reverse coded (1 = strongly agree; 5 = strongly disagree). Composite scores were calculated by averaging the values for individual items loading on each factor.

The three economic/service-related items and the seven social/environmental perceptual items were ranked in decreasing order according to mean score (see Table 2). As noted, each of the

mean scores for the items comprising the social/environmental factor, as well as the overall mean score for that factor, was higher than the mean score for the three economic/service-related items and the overall mean economic score. This indicated that, overall, residents viewed the items comprising the social/environmental factor less positively than the items comprising the economic/service-related factor. This finding parallels results from previous research in the Barnett Shale (Theodori 2013).

Table 2
Mean Scores for Perception of the Oil and Natural Gas Industry Items

	Mean score
Factor 1: Economic and service-related aspects of the oil and natural gas industry	
Because industry has to be competitive, it is unfair to expect oil and gas companies to tell the public about their plans.	2.95
All in all, the benefits of oil and gas development in the Eagle Ford Shale are greater than the costs.	2.23
The oil and natural gas industry is important to the local economy.	1.44
Overall mean – Factor 1	*2.21*
Factor 2: Social and environmental aspects of the natural gas industry	
The oil and gas industry must adopt and use more environmentally-friendly drilling practices in the Eagle Ford Shale.	3.88
Even when carefully controlled, oil and gas development is likely to upset the quality of life in a local area.	3.73
Not enough information concerning oil and gas development in the Eagle Ford Shale is being made available to the general public.	3.40
Oil and gas companies in the Eagle Ford Shale will do only what's required by law.	3.34
Too little attention is being paid to the social costs of oil and gas development in the Eagle Ford Shale.	3.25
Oil and gas industry operators in the Eagle ford Shale are too politically powerful.	3.24
The oil and gas has little interest in our natural environment.	2.90
Overall mean – Factor 2	*3.39*

The mean scores for respondents in Karnes County and La Salle County on the economic/ service-related factor were 2.15 and 2.31, respectively. The mean scores for respondents in Karnes County and La Salle County on the social/environmental factor were 3.27 and 3.59, respectively. In both cases, the difference between the two groups of respondents failed to attain statistical significance at the 0.05 level.

Perceived Problematic Issues Associated with Oil and Natural Gas Development

As in previous research on energy development in the Barnett Shale (Theodori 2007a, 2007b, 2009), perceptions of the potential problems associated with oil and natural gas development were assessed. Survey respondents were presented with 24 issues, some of which may or may not be problems in their counties. First, respondents were asked to indicate whether they believed each issue was "no problem at all," a "slight problem," a "moderate problem," or a "serious problem" in their county prior to large-scale development of oil and natural gas. For purposes of analysis, responses were coded as 1 = no problem at all, 2 = slight problem, 3 = moderate problem, and 4 = serious problem.

The 24 items were ranked in descending order by overall mean "seriousness before the large-scale development of oil and natural gas" score (see Table 3). At the aggregate level, respondents from these two south Texas counties viewed issues such as illegal drugs, availability of good jobs, outmigration of young people from the community after high school, illegal dumping, trash on roadsides, and property crimes (such as vandalism or theft) as the top six problematic issues in their counties before large-scale development of oil and natural gas. Concomitantly, issues such as land use conflicts, prostitution, light pollution, water quality, air quality, and man camps were viewed as being less problematic before the oil and gas boom.

Regardless of whether the respondent previously viewed the issue as problematic, he/she was then asked to indicate whether the issue was "getting worse," "getting better," or "staying the same" with large-scale development of oil and natural gas. Responses were coded as -1 (issue is getting worse), 0 (issue is staying the same), and 1 (issue is getting better).

As shown in Table 4, respondents reported that the previously problematic issues, such as availability of good jobs and the outmigration of young people from the community after high school, were getting better with the large-scale development of oil and natural gas in the region. Those issues viewed as being less problematic before the oil and gas boom – land use conflicts, prostitution, light pollution, water quality, air quality, and man camps – were now seen as getting worse due to the large-scale development.

Table 3

Perceived Problematic Issues Associated with Oil and Natural Gas Development before the Large-Scale Development of Oil and Natural Gas

Perceived problematic issues	Overall mean	Mean values by county[a]		
		Karnes County		La Salle County
Illegal drugs	2.92	2.78 (63)		3.14 (44)
Availability of good jobs	2.89	2.91 (69)		2.86 (44)
Young people leaving after high school	2.79	2.75 (63)		2.85 (41)
Illegal dumping	2.59	2.58 (67)		2.59 (44)
Trash on roadsides	2.56	2.63 (70)		2.44 (43)
Property crimes (such as vandalism or theft)	2.52	2.49 (69)		2.57 (44)
Violent crimes (such as assault or domestic abuse)	2.39	2.26 (65)	*	2.59 (44)
Local tax rates	2.33	2.26 (68)		2.43 (44)
Availability of affordable housing	2.30	2.19 (68)		2.48 (44)
Cost of food	2.27	1.90 (68)	***	2.84 (44)
Traffic accidents/safety	2.25	2.23 (66)		2.27 (44)
Spending in local businesses	2.20	2.16 (67)		2.26 (43)
Quality of local schools	2.15	2.16 (62)		2.12 (41)
Medical and health care services	2.08	1.99 (67)		2.23 (43)
Traffic congestion	2.04	2.16 (70)		1.86 (44)
Disagreements among local residents	1.98	1.95 (64)		2.02 (43)
Personal safety	1.98	1.85 (67)		2.19 (43)
Sense of community well-being	1.95	1.88 (66)		2.05 (44)
Land use conflicts	1.94	1.80 (66)		2.14 (43)
Prostitution	1.82	1.70 (60)		2.00 (40)
Light pollution	1.79	1.83 (66)		1.73 (44)
Water quality	1.76	1.66 (68)		1.91 (43)
Air quality	1.75	1.69 (67)		1.84 (43)
Man camps	1.48	1.50 (64)		1.44 (39)

[a] Number of respondents included in parentheses.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 4

Perceived Problematic Issues Associated with Oil and Natural Gas Development with Continued Large-Scale Development of Oil and Natural Gas

Perceived problematic issues	Overall mean	Mean values by county[a]		
		Karnes County		La Salle County
Traffic accidents/safety	-0.82	-0.74 (65)	*	-0.95 (42)
Traffic congestion	-0.72	-0.66 (67)		-0.81 (42)
Trash on roadsides	-0.68	-0.62 (68)		-0.78 (41)
Illegal dumping	-0.63	-0.58 (65)		-0.69 (42)
Cost of food	-0.58	-0.38 (65)	***	-0.88 (42)
Light pollution	-0.57	-0.54 (63)		-0.61 (41)
Property crimes (such as vandalism or theft)	-0.56	-0.47 (68)	*	-0.71 (42)
Illegal drugs	-0.55	-0.48 (62)		-0.66 (41)
Land use conflicts	-0.51	-0.38 (64)	**	-0.73 (41)
Personal safety	-0.50	-0.36 (64)		-0.71 (41)
Local tax rates	-0.49	-0.44 (66)		-0.57 (42)
Air quality	-0.47	-0.38 (66)	*	-0.62 (39)
Availability of affordable housing	-0.46	-0.39 (66)		-0.57 (42)
Violent crimes (such as assault of domestic abuse)	-0.38	-0.32 (63)		-0.48 (42)
Prostitution	-0.36	-0.23 (57)	**	-0.57 (35)
Water quality	-0.33	-0.23 (65)	*	-0.48 (42)
Man camps	-0.28	-0.23 (61)		-0.36 (36)
Disagreements among local residents	-0.25	-0.15 (62)	*	-0.40 (40)
Sense of community well-being	-0.21	-0.06 (64)	*	-0.44 (41)
Medical and health care services	0.16	0.29 (65)	*	-0.05 (40)
Young people leaving after high school	0.22	0.28 (60)		0.13 (38)
Quality of local schools	0.27	0.33 (64)		0.18 (40)
Spending in local businesses	0.46	0.66 (67)	***	0.14 (41)
Availability of good jobs	0.66	0.69 (67)		0.62 (42)

[a] Number of respondents included in parentheses.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Also shown in Table 3 and Table 4 are the mean scores for respondents in each county. Statistical significance of the observed perceptual differences between the respondents for the two counties was tested using a t-test for the difference between means. As indicated in Table 3, residents of La Salle County were significantly more likely than residents of Karnes County to report that violent crimes (such as vandalism and theft) ($p < 0.05$) and the cost of food ($p < 0.001$) were serious problems in their county before the large-scale development of oil and natural gas. And, as shown in Table 4, La Salle County residents were significantly more likely than Karnes County residents to report that the issues of violent crime ($p < 0.05$) and the cost of food ($p < 0.001$) were getting worse with the oil and gas boom. Furthermore, as indicated in Table 4, La Salle County residents were significantly more likely than Karnes County residents to perceive the issues of traffic accidents/safety ($p < 0.05$), land use conflicts ($p < 0.01$), air quality ($p < 0.05$), prostitution ($p < 0.01$), water quality ($p < 0.05$), disagreements among local residents ($p < 0.05$), sense of community well-being ($p < 0.05$), and medical and health care services ($p < 0.05$) as getting worse due to the large-scale development of oil and natural gas. Whereas residents in both counties perceived spending in local businesses as getting better due to the oil and gas boom, residents of Karnes County were significantly more likely than residents of La Salle County to do so ($p < 0.001$).

Trust in Selected Groups/Organizations as Sources of Information about the Positive and Negative Impacts of Oil and/or Natural Gas Development

Respondents were asked to indicate how much trust they had in each of 13 groups/organizations as sources of information about the positive and negative impacts of oil and/or natural gas development. The 13 groups/organizations listed on the survey included: (a) oil/natural gas industry; (b) Texas Railroad Commission; (c) U.S. Environmental Protection Agency; (d) Texas Commission on Environmental Quality; (e) Texas A&M AgriLife Extension; (f) environmental groups/organizations; (g) scientists/researchers; (h) South Texas Energy & Economic Roundtable (STEER); (i) America's Natural Gas Alliance (ANGA); (j) [respondent's] county government; (k) [respondent's] local city government; (l) Texas State Legislature; and (m) Eagle Ford Consortium. Response categories included "no trust," "very little trust," "some trust," a "great deal of trust" and "don't know." For purposes of analysis, response categories were dichotomized into "no trust/very little trust" and "some trust/a great deal of trust." Respondents who selected "don't know" were excluded from analysis.

Overall, more than eight in ten respondents reported they had some or a great deal of trust in Texas A&M AgriLife Extension (85%) and scientists/researchers (81%) as sources of information about the positive and negative impacts of oil and/or natural gas development (see Table 5). Three in four respondents (75%) had some or a great deal of trust in the oil/natural gas industry. One half (50%) of respondents had some or a great deal of trust in their county government, whereas only 43% of respondents had the same amount of trust in their local city government. An examination of the observed differences in levels of trust between the residents of the two counties revealed that residents of La Salle County were significantly more likely than residents of Karnes County to have some or a great deal of trust in environmental groups/organizations (74% vs. 53%).

Table 5

Trust in Groups/Organizations as Sources of Information about the Positive and Negative Impacts of Oil and/or Natural Gas Development

Groups/Organizations	Overall percent "some trust or great deal of trust"	Percent "some trust or great deal of trust" by county[a]		
		Karnes County		La Salle County
Texas A&M AgriLife Extension	85	85 (60)		84 (37)
Scientists/researchers	81	84 (61)		76 (34)
Oil/natural gas industry	75	78 (65)		68 (41)
Texas Commission on Environmental Quality	68	68 (59)		68 (40)
South Texas Energy & Economic Roundtable (STEER)	67	67 (46)		66 (29)
Texas Railroad Commission	65	65 (62)		65 (40)
America's Natural Gas Alliance (ANGA)	64	65 (54)		61 (31)
Environmental groups/organizations	61	53 (59)	*	74 (35)
Texas State Legislature	59	60 (62)		58 (38)
Eagle Ford Consortium	54	60 (55)		44 (36)
U.S. Environmental Protection Agency	53	50 (62)		56 (39)
[Respondent's] county government	50	52 (60)		46 (39)
[Respondent's] local city government	43	42 (62)		44 (39)

[a] Number of respondents included in parentheses.

* $p < 0.05$.

Satisfaction with the Performance of the Oil and Natural Gas Industry

Satisfaction with the oil and gas industry's performance was assessed using a list of 12 statements. Respondents were asked to indicate whether they were "very dissatisfied," "dissatisfied," "neither dissatisfied nor satisfied," "satisfied," or "very satisfied" with each of the following items:

a. Extent to which the industry knows about its impacts on local communities;
b. Extent to which the industry listens to concerns raised by local community residents;
c. Extent to which the industry responds to concerns raised by local community residents;
d. Extent to which the industry shares information about its activities with local communities;
e. Extent to which the industry's communications are interesting and helpful;
f. Extent to which crises are handled appropriately through communication by the industry;
g. Extent to which the industry is open to suggestions from local community leaders;
h. Extent to which industry communication practices are adaptable to local emergencies;
i. Extent to which industry communication with community residents is clear and concise;
j. Extent to which the industry anticipates the local community residents' need for information;
k. Extent to which the amount of communication with local community residents by the industry is about right; and
l. Extent to which the trustworthiness of communication by the industry is about right.

These 12 statements were ranked in descending order by overall mean "satisfaction" score (see Table 6). For purposes of analysis, responses were coded as 1 = very dissatisfied, 2 = dissatisfied, 3 = neither dissatisfied nor satisfied, 4 = satisfied, and 5 = very satisfied. Overall, respondents were most satisfied with the "extent to which industry communication practices are adaptable to local emergencies" (M = 3.21), followed by the "extent to which crises are handled appropriately through communication by industry" (M = 3.03). Conversely, respondents were least satisfied with the "extent to which the industry anticipates the local community residents' need for information" (M = 2.72).

Significance tests for the difference in mean satisfaction score of respondents from Karnes County and La Salle County were examined. Differences between these two groups of respondents failed to attain statistical significance at the 0.05 level.

Table 6
Satisfaction with the Performance of the Oil and Natural Gas Industry

Statements	Overall mean	Mean values by county[a]	
		Karnes County	La Salle County
Extent to which industry communication practices are adaptable to local emergencies.	3.21	3.33 (66)	3.00 (41)
Extent to which crises are handled appropriately through communication by the industry.	3.03	3.15 (65)	2.83 (42)
Extent to which the industry knows about its impacts on local communities.	2.99	3.07 (67)	2.86 (42)
Extent to which the industry responds to concerns raised by local community residents.	2.94	3.04 (67)	2.76 (42)
Extent to which the industry's communications are interesting and helpful.	2.91	3.03 (66)	2.71 (41)
Extent to which the industry listens to concerns raised by local community residents.	2.89	3.03 (67)	2.67 (42)
Extent to which the industry is open to suggestions from local community leaders.	2.89	3.02 (65)	2.68 (41)
Extent to which the industry shares information about its activities with local communities.	2.83	2.95 (66)	2.63 (40)
Extent to which the amount of communication with local community residents by the industry is about right.	2.78	2.88 (65)	2.62 (42)
Extent to which the trustworthiness of communication by the industry is about right.	2.78	2.89 (65)	2.60 (42)
Extent to which industry communication with community residents is clear and concise.	2.74	2.85 (66)	2.56 (41)
Extent to which the industry anticipates the local community residents' need for information.	2.72	2.82 (66)	2.56 (41)

[a] Number of respondents included in parentheses.

Actions Which May or May Not Have Been Taken in Response to the Exploration and Production of Oil and Natural Gas

In this study, respondents were asked to indicate (1) whether or not they engaged in certain actions as a response to the exploration and production of natural gas and (2) their likelihood of engaging in such actions in the future. First, respondents were asked whether or not (yes or no) they had ever:

a. Attended a public meeting to get information and learn more about the drilling and/or production of oil and natural gas;
b. Contacted a local elected official or governmental agency to complain about an oil and natural gas drilling and/or production issue;
c. Voted FOR a political candidate because of his/her position on the drilling and/or production of natural gas;
d. Voted AGAINST a political candidate because of his/her position on the drilling and/or production of natural gas;
e. Attended an energy industry-sponsored meeting to get information and learn more about the exploration and/or production of oil and natural gas;
f. Attended a public meeting to OPPOSE the exploration and/or production of oil and natural gas;
g. Attended a public meeting to SUPPORT the exploration and/or production of oil and natural gas; and
h. Wrote and mailed a letter to the editor of your local newspaper OPPOSING the continued exploration and/or production of oil and natural gas.

Next, respondents were asked to indicate their likelihood of engaging in each of these same eight actions in the future. Respondents had the option to select “not likely,” “somewhat likely,” or “very likely.” For purposes of analysis, responses to whether or not individuals had engaged in the possible actions were coded as 1 = yes and 0 = no. Responses to the likelihood of engagement items were dichotomized into 1 = likely and 0 = not likely.

The eight possible actions respondents may or may not have taken in response to the exploration and production of oil and natural gas were ranked in descending order by the percentage of respondents indicating they had engaged in it (see Table 7). Forty four percent of respondents attended a public meeting to get information and learn more about the drilling and/or production of oil and natural gas, while 40 percent of respondents attended an energy industry-sponsored meeting to get information and learn more about the exploration and/or production of oil and natural gas. Twenty seven percent of respondents voted – either for or against – a political candidate because of his/her position on the drilling and/or production of oil and natural gas, whereas 15 percent of respondents contacted a local elected official or governmental agency to complain about an oil and natural gas drilling and/or production issue. Roughly one in ten respondents (9%) attended a public meeting to support the exploration and/or production of oil and natural gas. One in twenty respondents (5%) attended a public meeting to oppose such exploration and production. Three percent of respondents wrote and mailed a letter to the editor of their local newspaper opposing the continued exploration and/or production of oil and natural gas.

The statistical significance of the observed differences between the respondents from the two counties with respect to the actions taken in response to the exploration and production of oil and natural gas were examined. As shown in Table 7, Karnes County respondents were significantly more likely than those from La Salle County to have attended an energy industry-sponsored meeting to get information and learn more about the exploration and/or production of oil and natural gas ($p < 0.05$) and voted for a political candidate because of his/her position on the drilling and/or production of natural gas ($p < 0.05$).

Table 7
Actions Taken in Response to the Exploration and Production of Oil and/or Natural Gas in or Near Respondent's Community

Actions	Overall % "yes"	Percent "yes" by county[a]		
		Karnes County		La Salle County
Attended a public meeting to get information and learn more about the drilling and/or production of oil and natural gas.	44	48 (67)		39 (41)
Attended an energy industry-sponsored meeting to get information and learn more about the exploration and/or production of oil and natural gas.	40	48 (65)	*	27 (41)
Voted AGAINST a political candidate because of his/her position on the drilling and/or production of natural gas.	27	32 (65)		19 (42)
Voted FOR a political candidate because of his/her position on the drilling and/or production of natural gas.	27	35 (66)	*	14 (42)
Contacted a local elected official or governmental agency to complain about an oil and natural gas drilling and/or production issue.	15	13 (67)		17 (42)
Attended a public meeting to SUPPORT the exploration and/or production of oil and natural gas.	9	14 (65)		2 (41)
Attended a public meeting to OPPOSE the exploration and/or production of oil and natural gas.	5	3 (65)		7 (42)
Wrote and mailed a letter to the editor of your local newspaper OPPOSING the continued exploration and/or production of oil and natural gas.	3	2 (65)		5 (42)

[a] Number of respondents included in parentheses.
* $p < 0.05$.

The reported likelihood of future engagement in the eight possible actions was also ranked in descending order (Table 8). As shown, about two in three respondents (66%) indicated they planned to attend a public meeting to get information and learn more about the drilling and/or production of oil and natural gas. Sixty four percent of respondents planned to attend an energy industry-sponsored meeting to get information and learn more about the exploration and/or production of oil and natural gas. About one half of the respondents planned to vote – either for or against – a political candidate because of his/her position on the drilling and/or production of oil and natural gas. Just over one in five respondents (22%) planned to attend a public meeting to oppose the exploration and/or production of oil and natural gas and/or write and mail a letter to

the editor of their local newspaper opposing the continued exploration and/or production of oil and natural gas.

The statistical significance of the observed differences between the respondents from the two counties with respect to the likelihood of actions that may be taken in response to the exploration and production of oil and natural gas were examined. As shown in Table 8, respondent in Karnes County were significantly more likely than those from La Salle County to plan to attend an energy industry-sponsored meeting to get information and learn more about the exploration and/or production of oil and natural gas ($p < 0.05$), attend an energy industry-sponsored meeting to get information and learn more about the exploration and/or production of oil and natural gas ($p < 0.05$), and to vote for ($p < 0.01$) or against ($p < 0.05$) a political candidate because of his/her position on the drilling and/or production of natural gas.

Table 8

Likelihood of Taking Actions in the Future in Response to the Exploration and Production of Oil and/or Natural Gas in or Near Respondent's Community

Actions	Overall % "likely"	Percent "likely" by county[a]		
		Karnes County		La Salle County
Attend a public meeting to get information and learn more about the drilling and/or production of oil and natural gas.	66	74 (62)	*	53 (40)
Attend an energy industry-sponsored meeting to get information and learn more about the exploration and/or production of oil and natural gas.	64	74 (61)	*	49 (39)
Vote FOR a political candidate because of his/her position on the drilling and/or production of natural gas.	51	63 (60)	**	32 (38)
Vote AGAINST a political candidate because of his/her position on the drilling and/or production of natural gas.	50	59 (59)	*	35 (37)
Attend a public meeting to SUPPORT the exploration and/or production of oil and natural gas.	48	54 (61)		38 (39)
Contact a local elected official or governmental agency to complain about an oil and natural gas drilling and/or production issue.	40	36 (59)		47 (38)
Attended a public meeting to OPPOSE the exploration and/or production of oil and natural gas.	22	25 (61)		18 (38)
Write and mail a letter to the editor of your local newspaper OPPOSING the continued exploration and/or production of oil and natural gas.	22	22 (59)		23 (39)

[a] Number of respondents included in parentheses.

* $p < 0.05$; ** $p < 0.01$.

Satisfaction with Communication Involving Oil and Gas Industry Activities
Satisfaction with communication involving the oil and gas industry's activities was assessed using seven statements. Respondents were asked to indicate whether they were "very dissatisfied," "dissatisfied," "neither dissatisfied nor satisfied," "satisfied," or "very satisfied" with each of the following items:

a. Oil and gas industry officials getting information out to the public;
b. Oil and gas industry officials soliciting input from the public;
c. Fairness of the communication process (*all citizens' voices and concerns are heard and considered*);
d. Effectiveness of county government in communicating information about oil and gas development;
e. Effectiveness of city government in communicating information about oil and gas development;
f. Availability of information about oil and gas development; and
g. Freedom to express my opinion about oil and gas development.

These seven statements were ranked in descending order by overall mean "satisfaction" score (see Table 9). For purposes of analysis, responses were coded as 1 = very dissatisfied, 2 = dissatisfied, 3 = neither dissatisfied nor satisfied, 4 = satisfied, and 5 = very satisfied. Overall, respondents were most satisfied that they had the freedom to express their opinions about oil and gas development in/near their community (M = 3.21). Respondents were least satisfied with the effectiveness of their county and city governments when it came to the communication of information about oil and gas development in/near their community (M = 2.41 and M = 2.38, respectively).

Significance tests for the difference in the mean satisfaction with communication score of respondents from Karnes County and La Salle County were examined. Differences between the two groups of respondents failed to reach statistical significance at the 0.05 level.

Table 9
Satisfaction with Communication Involving Oil and Natural Gas Industry Activities

Statements	Overall mean	Mean values by county[a]	
		Karnes County	La Salle County
Freedom to express my opinion about oil and gas development.	3.21	3.30 (63)	3.08 (40)
Oil and gas industry officials getting information out to the public.	2.81	2.89 (63)	2.68 (40)
Availability of information about oil and gas development.	2.80	2.84 (63)	2.73 (40)
Fairness of the communication process (*all citizens' voices and concerns are heard and considered*).	2.63	2.75 (63)	2.44 (39)
Oil and gas industry officials soliciting input from the public.	2.56	2.67 (63)	2.38 (39)
Effectiveness of county government in communicating information about oil and gas development.	2.42	2.41 (63)	2.43 (40)
Effectiveness of city government in communicating information about oil and gas development.	2.38	2.40 (62)	2.35 (40)

[a] Number of respondents included in parentheses.

Management Decisions Pertaining to Oil and Gas Development Occurring in/near Respondent's Communities

Respondents were asked to report the amount of influence they believed selected groups/organizations (1) *should have* and (2) *actually have* on the management decisions pertaining to the oil and gas development occurring in/near their communities. The groups/organizations included: (a) residents of local affected communities; (b) officials of local affected communities; (c) environmental interest groups; (d) commercial resource industries (agriculture, timber, etc.); (e) state natural resource agencies; (f) federal natural resource agencies; (g) U.S. Congress; and (h) Texas State Legislature.[2] Response categories included "no influence," "a little influence," "moderate influence," and "major influence." For purposes of analysis, response categories were coded 0 – 3, with 0 = no influence and 3 = major influence.

Respondents' beliefs about the perceived level of influence these groups/organizations *should have* on management decisions are summarized in Table 10. Their beliefs about the perceived level of influence the groups/organizations *actually have* on management decisions are summarized in Table 11.

As shown in Table 10, respondents believed residents of local affected communities should have the most influence on management decisions (M = 2.24), followed by officials of local affected communities (M = 2.10). Overall, respondents believed federal natural resource agencies (M = 1.49) and the U.S. Congress (M = 1.35) should have the least influence in local management

[2] Respondents were also asked to rate the perceived influence of "national public opinion" and "statewide public opinion." Neither forms of "opinion" were included in these analyses. Instead, the analyses were limited to the actual groups/organizations.

decisions pertaining to oil and gas development. Concomitantly, as shown in Table 11, respondents believed residents and officials of local affected communities actually have the least amount of influence in local management decisions (M = 1.09 and M = 1.50, respectively). Respondents also believed the U.S. Congress and federal natural resource agencies ranked near the top with respect to the groups/organizations that actually have the most influence over local management decisions (M = 2.05 and M = 1.90, respectively). The Texas State Legislature (M = 2.20) was the group/organization perceived to actually have the most influence.

Significance tests for the difference in the mean levels of perceived influence the selected groups/organizations "should have" and "actually have" between respondents from Karnes County and La Salle County were examined. Differences between the two groups of respondents failed to reach statistical significance at the 0.05 level.

Table 10

Amount of Influence Groups/Organizations *Should Have* on Management Decisions Pertaining to Oil and Gas Development

Groups/Organizations	Overall mean	Mean values by county[a]	
		Karnes County	La Salle County
Residents of local affected communities	2.24	2.21 (63)	2.30 (40)
Officials of local affected communities	2.10	2.06 (63)	2.15 (40)
Commercial resource industries (agriculture, timber, etc.)	1.96	1.97 (63)	1.95 (40)
State natural resource agencies	1.87	1.84 (63)	1.92 (39)
Texas State Legislature	1.82	1.75 (64)	1.92 (39)
Environmental interest groups	1.69	1.56 (63)	1.90 (40)
Federal natural resource agencies	1.49	1.46 (63)	1.53 (40)
U.S. Congress	1.35	1.19 (63)	1.60 (40)

[a] Number of respondents included in parentheses.

Table 11
Amount of Influence Groups/Organizations *Actually Have* on Management Decisions Pertaining to Oil and Gas Development

Groups/Organizations	Overall mean	Mean values by county[a]	
		Karnes County	La Salle County
Texas State Legislature	2.20	2.22 (63)	2.15 (39)
U.S. Congress	2.05	1.97 (62)	2.18 (39)
Federal natural resource agencies	1.90	1.84 (61)	2.00 (39)
State natural resource agencies	1.85	1.87 (62)	1.82 (39)
Environmental interest groups	1.57	1.55 (62)	1.62 (39)
Commercial resource industries (agriculture, timber, etc.)	1.56	1.60 (62)	1.51 (39)
Officials of local affected communities	1.50	1.48 (62)	1.54 (39)
Residents of local affected communities	1.09	1.20 (61)	0.92 (39)

[a] Number of respondents included in parentheses.

Efforts by Federal and State Agencies and Regional and Local Groups/Organizations to Include Local Residents' Input into Decisions Regarding Oil and Gas Industry Development

Using a response scale of 1 (far too little) to 7 (far too much), respondents were asked to circle the number that best indicated how much effort they believed selected federal/state agencies and regional/local groups/organizations make to include local residents' concerns into decisions regarding oil and gas industry development. Selected federal and state agencies included: (a) Environmental Protection Agency; (b) Texas Railroad Commission; (c) Texas A&M AgriLife Extension; (d) Texas Commission on Environmental Quality; and (e) Texas State Legislature. Selected regional and local groups/organizations included: (a) oil and gas industry; (b) environmental groups/organizations; (c) scientists/researchers; (d) South Texas Energy & Economic Roundtable (STEER); (e) America's Natural Gas Alliance (ANGA); (f) county government; (g) city government; and (h) Eagle Ford Consortium.

Respondents' beliefs about the amount of effort federal/state agencies and regional/local groups/organizations made to include local residents' concerns into decisions regarding oil and gas industry development are presented in Table 12. Of the 13 agencies and groups/ organizations, respondents believed that, overall, their city and county governments made the least effort to include local residents' concerns into decisions regarding oil and gas industry development (M = 2.79 and M = 2.87, respectively). Respondents believed environmental groups/organizations (M = 3.39), scientists/researchers (M = 3.40), and Texas A&M AgriLife Extension (M = 3.47) made the most concerted efforts to include local residents' concerns into decisions regarding oil and gas industry development.

Significance tests for the difference in the mean "effort" score of respondents from Karnes County and La Salle County were examined. Differences between the two groups of respondents failed to reach statistical significance at the 0.05 level.

Table 12
Perceived Efforts by Federal and State Agencies and Regional and Local Groups/Organizations to Include Local Residents' Input into Decisions Regarding Oil and Gas Industry Development

Agencies/Groups/Organizations	Overall mean	Mean values by county[a]	
		Karnes County	La Salle County
[Respondent's] city government	2.79	2.90 (60)	2.61 (38)
[Respondent's] county government	2.87	3.00 (61)	2.66 (38)
Texas State Legislature	3.03	3.08 (60)	2.95 (39)
Texas Railroad Commission	3.07	3.13 (61)	2.97 (39)
Environmental Protection Agency	3.08	3.13 (62)	3.00 (39)
South Texas Energy & Economic Roundtable (STEER)	3.18	3.17 (60)	3.19 (37)
Eagle Ford Consortium	3.19	3.25 (59)	3.10 (39)
America's Natural Gas Alliance (ANGA)	3.24	3.22 (59)	3.28 (36)
Texas Commission on Environmental Quality	3.26	3.23 (61)	3.31 (36)
Oil and gas industry	3.26	3.28 (61)	3.23 (39)
Environmental groups/organizations	3.39	3.26 (61)	3.61 (38)
Scientists/researchers	3.40	3.22 (60)	3.68 (38)
Texas A&M AgriLife Extension	3.47	3.43 (60)	3.53 (38)

[a] Number of respondents included in parentheses.

Hydraulic Fracturing and the Management, Disposal, and Reuse of Frac Flowback Waters

Building upon earlier research from the Marcellus Shale (Theodori, Luloff, Willits, and Burnett 2014), a number of empirical issues associated with the public's views on hydraulic fracturing and the management, disposal, and reuse of frac flowback wastewaters were examined in this study. The measurement of the concepts and the findings are detailed below.

Measuring Familiarity with the Process of Hydraulic Fracturing

Familiarity with the process of hydraulic fracturing was assessed with a single survey item that ranged from 1 (extremely unfamiliar) to 7 (extremely familiar).

Measuring Contribution Made to Knowledge about the Process of Hydraulic Fracturing

Respondents were asked to indicate the degree to which each of 15 sources contributed to what they knew about the process of hydraulic fracturing. The 15 sources included: (1) newspapers; (2) internet websites; (3) *Gasland* or *Gasland 2* (the films by Josh Fox); (4) Texas A&M AgriLife Extension; (5) oil/natural gas industry; (6) regulatory agencies; (7) conservation/ environmental groups; (8) social media; (9) university professors; (10) landowner groups/ coalitions; (11) neighbors; (12) friends in community; (13) elected county officials; (14) elected city officials; and (15) religious leaders. Responses were coded as 0 = none, 1 = very little, 2 = some, and 3 = a great deal.

Measuring Trust to Deliver Unbiased, Factual Information on Hydraulic Fracturing
Respondents were asked to indicate the amount of trust in each of the same 15 sources to deliver unbiased, factual information on hydraulic fracturing. Response were coded as 0 = no trust, 1 = very little trust, 2 = some trust, and 3 = a great deal of trust.

Measuring Familiarity with the Management and Disposal of Frac Flowback Water in the Eagle Ford Shale
Familiarity with the management and disposal of frac flowback water in the Eagle Ford Shale was assessed using a single survey item that ranged from 1 (extremely unfamiliar) to 7 (extremely familiar).

Measuring Familiarity with Frac Flowback Wastewater Treatment Technology
Familiarity with frac flowback wastewater treatment technology was assessed using a single survey item that ranged from 1 (extremely unfamiliar) to 7 (extremely familiar).

Measuring Potential Uses of Treated Wastewater from Hydraulic Fracturing Operations
Potential uses of treated wastewater from hydraulic fracturing operations were evaluated using a list of eight practices. Respondents were asked whether they believed treated wastewater from hydraulic fracturing operations could safely be used for: (1) re-use by oil and gas industry operators; (2) watering of livestock; (3) industrial use (e.g., manufacturing, etc.); (4) people's drinking water; (5) municipal uses (e.g., watering of golf courses and city parks, etc.); (6) irrigation of farmland; (7) maintenance of stream flows/reservoir levels; and (8) home irrigation purposes (e.g., watering lawns and shrubs, etc.).

Results: Familiarity with the Process of Hydraulic Fracturing
Overall Results
In total, 7.7 percent of respondents reported being *extremely unfamiliar* with the process of hydraulic fracturing, and an additional 16.4 percent rated their familiarity at 2 or 3 on the seven-point response scale. Conversely, roughly one of every ten respondents (10.6%) indicated they were *extremely familiar* with the hydraulic fracturing process and about half (50%) indicated they had some familiarity (scores 5 and 6 on the response scale). The mean level of familiarity with the process of hydraulic fracturing was 4.65 (SD = 1.67).

Results for Respondents in Karnes County and La Salle County
Less than two percent (1.5%) of respondents in Karnes County reported being *extremely unfamiliar* with the process of hydraulic fracturing, compared to approximately eighteen percent (17.9%) of respondents in La Salle County. Roughly one in ten respondents in both counties (10.8% in Karnes and 10.3% in La Salle) reported being *extremely familiar* with the hydraulic fracturing process. A t-test for the difference between means revealed that the mean level of familiarity with the process of hydraulic fracturing among Karnes County (M = 4.97, SD = 1.37) respondents was significantly ($p < 0.05$) higher than for respondents from La Salle County (M = 4.13, SD = 1.98).

Results: Contribution Made to Knowledge about the Process of Hydraulic Fracturing

Overall Results

The 15 sources that may or may not have contributed to what respondents knew about hydraulic fracturing were ranked in ascending order by overall mean score (see Table 13). Newspapers (M = 1.68) were the sources of information that contributed most to respondents' knowledge of the hydraulic fracturing process, followed closely by the oil/natural gas industry (M = 1.67) and internet websites (M = 1.60). The movies *Gasland* and/or *Gasland 2* (M = 0.63) and religious leaders (M = 0.48) were the sources of information that contributed least to respondents' knowledge of hydraulic fracturing.

Results for Respondents in Karnes County and La Salle County

The pattern of results for respondents in each county more or less mirrored the overall sample. In both counties, *Gasland* and/or *Gasland 2* (Karnes, M = 0.62; La Salle, M = 0.66) and religious leaders (Karnes, M = 0.42; La Salle, M = 0.57) were the sources of information that contributed least to respondents' knowledge of hydraulic fracturing. Slight differences emerged, however, with respect to the sources that contributed most to respondents' knowledge of the hydraulic fracturing process between the counties. For Karnes County respondents, the oil/gas industry (M = 1.83) was the source of information that contributed most to respondents' knowledge of the hydraulic fracturing process, followed by internet websites (M = 1.69). For La Salle County respondents, newspapers (M = 1.71) were the sources that contributed most to respondents' knowledge of the hydraulic fracturing process, followed by internet websites (M = 1.44).

The statistical significance of the observed differences between the respondents from the two counties regarding sources of information that may or may not have contributed to their knowledge of hydraulic fracturing were tested using t-tests. Results revealed that respondents in Karnes County were significantly ($p < 0.05$) more likely than those in La Salle County to report that the oil/natural gas industry contributed to their knowledge of hydraulic fracturing.

Table 13
Contribution Made By Fifteen Sources of Information to Knowledge about Hydraulic Fracturing

Sources of information	Overall mean	Mean values by county[a]		
		Karnes County		La Salle County
Newspapers	1.68	1.66 (65)		1.71 (42)
Oil/natural gas industry	1.67	1.83 (64)	**	1.43 (42)
Internet websites	1.60	1.69 (65)	*	1.44 (39)
Friends in community	1.53	1.66 (65)		1.32 (41)
Neighbors	1.49	1.60 (63)		1.32 (41)
Landowner groups/coalitions	1.26	1.38 (65)		1.07 (41)
Social media	1.20	1.17 (64)		1.24 (42)
Regulatory agencies	1.06	1.08 (63)		1.02 (41)
Conservation/environmental groups	1.06	1.02 (65)	*	1.12 (41)
Texas A&M AgriLife Extension	0.89	0.89 (64)		0.88 (41)
Elected county officials	0.86	0.81 (63)		0.93 (41)
University professors	0.83	0.89 (64)		0.74 (42)
Elected city officials	0.75	0.66 (64)		0.90 (41)
Gasland and/or *Gasland 2* (the films by Josh Fox)	0.63	0.62 (63)		0.66 (41)
Religious leaders	0.48	0.42 (65)		0.57 (42)

[a] Number of respondents included in parentheses.
* $p < 0.05$.

Results: Trust to Deliver Unbiased, Factual Information on Hydraulic Fracturing

Overall Results

The fifteen sources respondents may or may not trust to deliver unbiased, factual information on hydraulic fracturing were ranked in ascending order by overall mean score (see Table 14). Newspapers ($M = 1.76$) were the sources respondents trusted most to deliver unbiased, factual information on hydraulic fracturing, followed closely by Texas A&M AgriLife Extension ($M = 1.69$) and internet websites ($M = 1.66$). Elected county officials ($M = 0.94$), elected city officials ($M = 0.85$), and religious leaders ($M = 0.82$) were the respondents' least-trusted sources of information.

Results for Respondents in Karnes County and La Salle County

Respondents in Karnes County rated internet websites ($M = 1.80$), newspapers ($M = 1.76$), and the oil/natural gas industry ($M = 1.72$) as the sources they trusted most to deliver unbiased, factual information on hydraulic fracturing. In La Salle County, respondents rated Texas A&M AgriLife Extension ($M = 1.76$), newspapers ($M = 1.60$), and internet websites ($M = 1.44$) as their

most trusted sources. Respondents in both counties rated elected officials (both at the county and city levels) and religious leaders among their least-trusted sources.

The statistical significance of the observed differences between the respondents from the two counties with respect to sources of information they may or may not trust to deliver unbiased, factual information on hydraulic fracturing were tested using t-tests. Three of the fifteen sources were found to differ significantly. Respondents in Karnes County were significantly more likely than those in La Salle County to trust internet websites ($p < 0.05$) and the oil/natural gas industry ($p < 0.01$). Concomitantly, La Salle County respondents were more likely than Karnes County respondents to trust conservation/environmental groups ($p < 0.05$).

Table 14

Trust in Fifteen Sources of Information to Deliver Unbiased, Factual Information on Hydraulic Fracturing

Sources of information	Overall mean	Mean values by county[a]		
		Karnes County		La Salle County
Newspapers	1.70	1.76 (63)		1.60 (43)
Texas A&M AgriLife Extension	1.69	1.65 (62)		1.76 (41)
Internet websites	1.66	1.80 (61)	*	1.44 (41)
Friends in community	1.57	1.68 (63)		1.39 (41)
Oil/natural gas industry	1.53	1.72 (65)	**	1.24 (42)
Landowner groups/coalitions	1.46	1.59 (63)		1.27 (41)
Neighbors	1.45	1.51 (63)		1.36 (42)
Regulatory agencies	1.37	1.41 (63)		1.31 (42)
University professors	1.29	1.31 (62)		1.27 (41)
Conservation/environmental groups	1.10	0.92 (63)	*	1.37 (41)
Gasland and/or *Gasland 2* (the films by Josh Fox)	0.99	0.97 (61)		1.02 (42)
Social media	0.97	0.92 (63)		1.05 (41)
Elected county officials	0.94	0.92 (64)		0.98 (42)
Elected city officials	0.85	0.77 (64)		0.98 (42)
Religious leaders	0.82	0.73 (64)		0.95 (42)

[a] Number of respondents included in parentheses.

* $p < 0.05$; ** $p < 0.01$.

Results: Familiarity with the Management and Disposal of Frac Flowback Water in the Eagle Ford Shale

Overall Results

Overall, 17.1 percent of the respondents reported being *extremely unfamiliar* with the management and disposal of frac flowback water in the Eagle Ford Shale. An additional 24.3 percent rated their familiarity at 2 or 3 on the seven-point response scale. Conversely, 7.2 percent of respondents indicated they were *extremely familiar* with the management and disposal of frac flowback in the region and about one third (33.3%) indicated they had some familiarity (scores 5 and 6 on the response scale). The mean level of familiarity with the management and disposal of frac flowback water in the Eagle Ford Shale was 3.86 (SD = 1.88).

Results for Respondents in Karnes County and La Salle County

Among respondents in Karnes County, 4.5 percent reported being *extremely unfamiliar* with the management and disposal of frac flowback water in the Eagle Ford Shale; slightly more than one third (36.4%) of respondents in La Salle County indicated the same lack of familiarity. In Karnes County, 9 percent of respondents reported being *extremely familiar* with the management and disposal of frac flowback water in the Eagle Ford, compared to 4.5 percent in La Salle County.

The mean level of familiarity with the management and disposal of frac flowback water in the Eagle Ford Shale was 4.33 (SD = 1.60) for respondents in Karnes County and 3.16 (SD = 2.07) for respondents in La Salle County. This difference attained statistical significance at the 0.01 level of significance.

Results: Familiarity with Frac Flowback Wastewater Treatment Technology

Overall Results

Slightly less than one in five respondents (18.2%) reported being *extremely unfamiliar* with frac flowback wastewater treatment technology, and an additional 34.5 percent rated their familiarity at 2 or 3 on the seven-point response scale. Conversely, 3.6 percent of respondents indicated they were *extremely familiar* with frac flowback wastewater treatment technology and 28.2 percent indicated they had some familiarity (scores 5 and 6 on the response scale). The mean level of familiarity with frac flowback wastewater treatment technology was 3.43 (SD = 1.70).

Results for Respondents in Karnes County and La Salle County

In Karnes County, 6.1 percent of respondents reported being *extremely unfamiliar* with frac flowback wastewater treatment technology, compared to 36.4 percent of respondents in La Salle County. Three percent of respondents in Karnes County and 4.5 percent of respondents in La Salle County reported being *extremely familiar* with the technology. A t-test for the difference between means revealed that the mean level of familiarity with frac flowback wastewater treatment technology among respondents in Karnes County (M = 3.70, SD = 1.38) was significantly ($p < 0.05$) higher than for respondents in La Salle County (M = 3.02, SD = 2.04).

Results: Potential Uses of Treated Wastewater from Hydraulic Fracturing Operations

The eight potential uses of treated wastewater from hydraulic fracturing operations were ranked in descending order by the percentage of respondents indicating "yes" (see Table 15). Approximately nine in ten respondents (91%) believed re-use in the gas and oil industry was the safest potential use. More than three in four respondents (78%) believed treated wastewater from hydraulic fracturing operations could safely be used for industrial use (e.g., manufacturing, etc.), whereas just over one half of respondents (55%) agreed such water could be used for municipal purposes (e.g., watering golf courses and city parks, etc.). Roughly four in ten respondents (42%), one in three respondents (33%), and one in four respondents (24%) claimed that home irrigation, irrigation of farmland, and maintenance of stream flows/reservoir levels could be accomplished with the use of treated wastewater from hydraulic fracturing operations, respectively. Thirteen percent of respondents agreed that treated wastewater from hydraulic fracturing operations could be used to water livestock. Finally, four percent of respondents believed such treated wastewater could safely be used by humans as potable water.

Significance tests for the difference in the proportion of respondents from Karnes County and La Salle County who perceived safe potential uses of treated wastewater from hydraulic fracturing operations were examined. Differences between the two groups of respondents failed to reach statistical significance at the 0.05 level.

Table 15

Perceived Safe Potential Uses of Treated Wastewater from Hydraulic Fracturing Operations

Potential uses	Overall % "yes"	Percent "yes" by county[a]	
		Karnes County	La Salle County
Re-use by gas and oil industry operators	91	94 (67)	86 (43)
Industrial use (e.g., manufacturing, etc.)	78	76 (67)	81 (42)
Municipal uses (e.g., watering golf courses and city parks, etc.)	55	60 (67)	47 (43)
Home irrigation purposes (e.g., watering lawns and shrubs, etc.)	42	41 (66)	44 (43)
Irrigation of farmland	33	36 (66)	28 (43)
Maintenance of stream flows/reservoir levels	24	20 (66)	30 (43)
Watering of livestock	13	10 (67)	16 (43)
People's drinking water	4	2 (66)	7 (43)

[a] Number of respondents included in parentheses.

* $p < 0.05$.

SUMMARY

The descriptive findings and bivariate analyses conveyed in this summary report illustrate a rather broad range of perceived negative and positive issues associated with oil and natural gas development in the Eagle Ford Shale region. In summary, key findings from this research include the following:

- First, it appears that residents and absentee landowners in the Eagle Ford Shale viewed more negatively the social and/or environmental issues perceived to accompany large-scale energy development than the economic and/or service-related benefits that often result from such development (see Table 2). This finding parallels results from previous research in the Barnett Shale (Theodori 2013).

- Second, certain issues perceived to be slight-to-moderate problems in the Eagle Ford Shale region prior to the oil and gas boom are now viewed as getting worse due to the large-scale development (see Table 3 and Table 4). Overall, the problematic issues perceived to be worsening the most in the region were traffic-related – both traffic accidents and traffic congestion. Traffic issues – particularly those associated with increased truck traffic – are of critical concern to residents in/around energy boom towns (Anderson and Theodori 2009; Quiroga and Tsapakis 2015; Theodori 2009). Conversely, previously problematic issues, such as availability of good jobs and the outmigration of young people from the community after high school, were perceived to be getting better with the large-scale development of oil and natural gas in the region.

- Third, residents and absentee landowners in the Eagle Ford Shale were least trusting of the county and city governments as being sources of information about the positive and negative impacts of oil and/or natural gas development (see Table 5). Residents and absentee landowners were least satisfied with the effectiveness of their county and city governments when it came to the communication of information about oil and gas development in/near their community (see Table 9). Moreover, residents and absentee landowners were also least satisfied with the efforts of county and city governments to include local residents' concerns into decisions regarding oil and gas development (see Table 12). Residents and absentee landowners rated elected officials (both at the county and city levels), along with local religious leaders, among their least-trusted sources of information to deliver unbiased, factual information on hydraulic fracturing (see Table 14). Concomitantly, residents and absentee landowners were more trusting of Texas A&M AgriLife Extension, scientists/researchers, and the oil/natural gas industry as sources of information about the positive and negative impacts of oil and/or natural gas development (see Table 5). Residents and absentee landowners were more satisfied with oil and gas industry officials as conduits of communication involving oil and gas activities than they were with their county and government officials (see Table 9). Further, residents and absentee landowners were also more satisfied with the efforts of the Extension agency, scientists/researchers, and the oil/natural gas industry to include local residents' concerns into decisions regarding oil and gas development (see Table 12). Moreover, Texas A&M AgriLife Extension and the oil/natural gas industry ranked in the top five most-trusted sources of information to deliver unbiased, factual information on hydraulic fracturing (second and fifth, respectively) (see Table 14).

- Fourth, there was a discrepancy between the perceived amount of influence residents and officials *should have* and the perceived amount of influence residents and officials *actually have* on management decisions pertaining to local oil and gas development (see Table 10 and Table 11). Survey respondents believed residents and local officials should have the most influence on management decisions, yet they believed such citizens and leaders actually have the least amount of influence. Concurrently, respondents believed state and federal groups/organizations – the Texas State Legislature, the U.S. Congress, and federal and state natural resources agencies – actually have the most influence on management decisions, yet they believed such groups/organizations should have lesser amounts of influence.

- Fifth, residents and absentee landowners were more or less satisfied with the performance of the oil and natural gas industry in the Eagle Ford Shale (see Table 6). Survey respondents were more satisfied with the extent to which industry communication practices are adaptable to local emergencies and the extent to which crises are handled appropriately through communication by the industry. They were less satisfied with the clarity and conciseness of the communication from industry and the extent to which they believed industry anticipates local community residents' need for information.

- Sixth, these data revealed that residents and absentee landowners have engaged or plan to engage in certain types of actions more so than other types (see Table 7 and Table 8). Survey respondents were more likely to have attended (or plan to attend) meetings to get information and learn more about oil and natural gas development. They were less likely to have engaged in (or plan to engage in) behaviors overtly opposing energy production, such as attending public meetings or writing letters to the editor of their local newspaper to oppose the continued exploration and/or production of oil and natural gas. These data revealed that a larger percentage of residents and absentee landowners in Karnes County as opposed to La Salle County have engaged in (or plan to engage in) the overwhelming majority of the eight actions presented in the survey.

- Lastly, the investigation of residents' and absentee landowners' beliefs that treated frac flowback could safely be used for eight potential purposes indicated the overall pattern of results paralleled those uncovered from the general public in the Marcellus Shale region (Theodori et al. 2014). The findings here (see Table 15), as well as those from the Marcellus Shale region, demonstrate that acceptance of/opposition to the use of treated frac flowback wastewater varies directly with intimacy or degree of human contact.

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