

LOCAL GOVERNMENTS AND MARCELLUS SHALE DEVELOPMENT

The Marcellus Impacts Project Report #7



Executive Summary

Local government officials are on the front lines of Marcellus shale development activity in Pennsylvania, providing important public services and infrastructure, planning for future changes within their communities, and responding to public health and safety concerns. They serve a vital communication role between the gas industry and citizens, and are often the first entities notified when there is a problem.

This research used data from two focus groups of local government officials, one group in the southwest and one group in the northern tier, to identify how Marcellus shale development is affecting municipal governments in Pennsylvania. It is supplemented by an analysis of local government audit reports from 2007 to 2010 (the most recent available data) of spending and revenue. Findings indicate that:

- **Public Services and Infrastructure:** Most of the infrastructure issues raised by local officials focused on the impacts on roads as a result of the heavy truck traffic. In many of the townships, gas companies have repaired and upgraded the roads at their own expense, leaving the township with roads that were in better condition than previously. The transient nature of the workforce has created some confusion and trouble in the housing sector, particularly due to the fluctuating number of workers over time.
- **County and Municipal Budgets:** Analysis of the county audit data did not show any clear patterns of how the unconventional gas development is affecting local government budgets, at least through 2011 (data capturing the impact of Act 13 dollars on local budgets were not yet available).
- **Act 13 Expenditures:** Many local officials reported spending impact fee dollars on new equipment or new infrastructure to replace what has been damaged, directly or indirectly, by drilling. It is unclear how much of this Act 13 spending is new rather than a substitute for already existing spending.
- **Industry/Local Government Relations:** Most local officials reported that local governments were unprepared for the beginning of natural gas development within their jurisdictions, and that there was much confusion and a lack of understanding among residents and officials. In some cases, officials received very little warning that the activity was to begin in their townships, so they were unable to prepare adequately.

The data and analysis indicate that, so far, Marcellus shale development has not had a consistent and major impact on municipalities and county governments in the commonwealth, though officials report impacts in some locations.

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The Center for Rural Pennsylvania is a bipartisan, bicameral legislative agency that serves as a resource for rural policy within the Pennsylvania General Assembly. It was created in 1987 under Act 16, the Rural Revitalization Act, to promote and sustain the vitality of Pennsylvania's rural and small communities.

Information contained in this report does not necessarily reflect the views of individual board members or the Center for Rural Pennsylvania. For more information, contact the Center for Rural Pennsylvania, 625 Forster St., Room 902, Harrisburg, PA 17120, telephone (717) 787-9555, email: info@rural.palegislature.us, www.rural.palegislature.us.

About This Project:

The Marcellus Shale Impacts Project chronicles the effects of shale-based energy development in Pennsylvania by focusing on the experiences of four counties with significant extraction and production activity – Bradford, Lycoming, Greene, and Washington counties. The project examines social and economic changes in these counties within the context of regional and statewide trends. A series of nine reports describes the research results as follows: (1) population, (2) health, (3) education, (4) youth, (5) housing, (6) crime, (7) local government, (8) local economy, and (9) agriculture.

Study Counties

Bradford, Lycoming, Greene, and Washington counties are studied in this project. They have experienced some of the highest levels of Marcellus Shale development in Pennsylvania, yet they have diverse populations, histories, economic bases, and geographic locations. These differences allow comparisons that facilitate understanding of the potential effects of Marcellus Shale development across the commonwealth and by region. The regional comparisons are defined based on adjacency to the four study counties. The northern tier contains 12 counties: Bradford, Lycoming, and the 10 neighboring counties of Clinton, Columbia, Montour, Northumberland, Potter, Sullivan, Susquehanna, Tioga, Union, and Wyoming. The southwest region consists of six counties: Greene, Washington, and the four neighboring counties of Allegheny, Beaver, Fayette, and Westmoreland.

All four study counties are classified as rural by the Center for Rural Pennsylvania with population densities of less than 284 people per square mile.

Table 1 offers an overview of selected characteristics from 2000 for the four study counties as well as counties in the surrounding region and the state. These data provide important context for understanding differences between the counties and regions prior to Marcellus Shale development. As Table 1 shows how the counties and regions differ across indicators. In the northern tier, Lycoming's population was nearly twice that of Bradford's, and Lycoming County had a slightly higher unemployment rate than Bradford County. The percentage employed in mining was very small in 2000 in both northern tier counties, although a larger percentage of people were employed in the industry in Bradford (0.6 percent) than in Lycoming (just 0.1 percent). The two counties had comparable median household incomes.

In the southwest, the differences between Greene and Washington are more pronounced. Greene had the smallest population of the four counties (40,672) and 6.7 percent of employed individuals in the county were working in mining. The unemployment rate (9.2 percent) was more than 3 points above the state's average (5.7 percent), and the median household income (\$41,972) was well below average for the region (\$52,004) and the state (\$55,460). In contrast, the median household income in Washington County was just over \$10,000 higher than in Greene. Only 1.3 percent of the employed work in mining and the unemployment rate was notably lower (5.3 percent).

The two counties of the southwest had more diversified economies than counties of the northern tier. In Bradford and Lycoming, the same three industries (Manufacturing, Health Care and Social Assistance, and Retail Trade) employed around half the population (52.4 percent and 47.4 percent, respectively (Census 2000). In contrast, just over one-third of the working population in Greene County worked in the same three industries (Health Care and Social Assistance, Retail Trade, and Educational Services). Washington's top three industries (Manufacturing, Health Care and Social Assistance, Retail Trade, and Manufacturing) employed 41.7 percent of the working population.

Table 1. Pre-Marcellus characteristics of study counties in 2000

	Population	People per square mile	% employed in Mining	% Unemployed	Median Household Income (adjusted for inflation to 2012 values)
Northern Tier*	47,968	83	0.6%	6.0%	\$47,071
Bradford	62,761	55	0.6%	5.5%	\$48,451
Lycoming	120,044	97	0.1%	6.3%	\$47,038
Southwest*	370,881	505	1.8%	6.6%	\$47,901
Greene	40,672	71	6.7%	9.2%	\$41,972
Washington	202,897	237	1.3%	5.3%	\$52,004
Pennsylvania	12,281,054	274	0.3%	5.7%	\$55,460

The northern tier region contains 12 counties: Bradford, Lycoming, and the 10 neighboring counties of Clinton, Columbia, Montour, Northumberland, Potter, Sullivan, Susquehanna, Tioga, Union, and Wyoming. The southwest region consists of six counties: Greene, Washington, and the four neighboring counties of Allegheny, Beaver, Fayette, and Westmoreland. Source: Social Explorer Tables (SE), Census 2000, U.S. Census Bureau and Social Explorer. * County average includes study counties.

Marcellus Shale Activity

Table 2 shows the number of unconventional wells drilled in the Marcellus Shale each year in the six Pennsylvania counties with the highest total number of wells drilled between 2005 and mid-year 2013 (Pennsylvania Department of Environmental Protection).

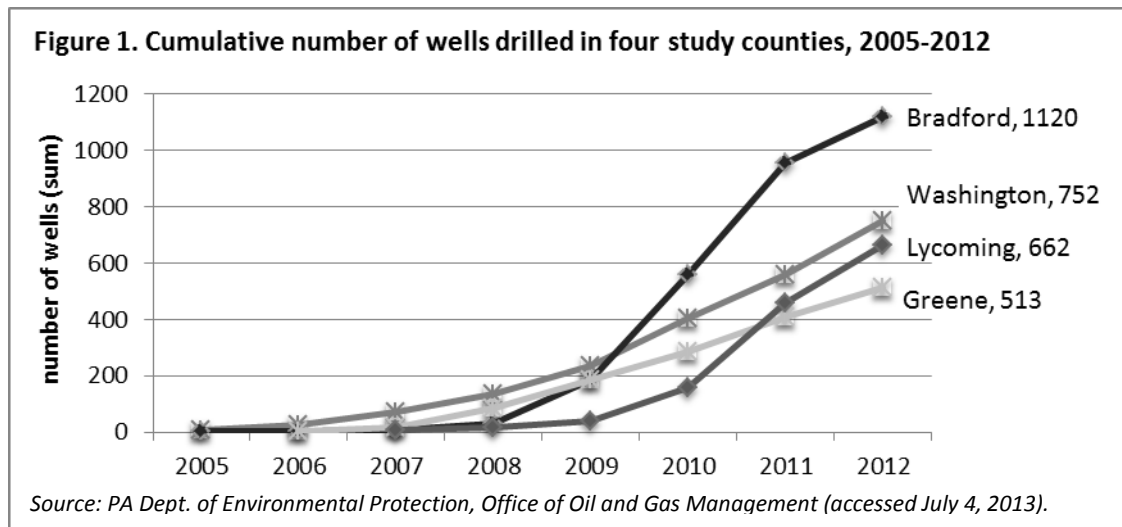
Table 2. Six counties with the most wells drilled and wells drilled each year, 2005-2013*

county name	2005	2006	2007	2008	2009	2010	2011	2012	2013* mid-year	Total, by county
Bradford⁺	1	2	2	24	158	373	396	164	66	1186
Washington⁺	5	19	45	66	101	166	155	195	120	872
Tioga	0	1	0	15	124	273	272	122	13	820
Lycoming⁺	0	0	5	12	23	119	301	202	89	751
Susquehanna	0	1	2	33	88	125	205	191	102	747
Greene⁺	0	2	14	67	101	103	121	105	54	567
Total wells drilled in top six counties:										4943

Source: Pennsylvania Department of Environmental Protection, Office of Oil and Gas Management. *Data through June 30, 2013 (accessed July 4, 2013); ⁺Study counties.

The four study counties have experienced significant Marcellus Shale well drilling and account for half (3,376) of the 6,833 unconventional wells drilled in the commonwealth. The two counties located in the southwest, Washington and Greene, experienced more well development through 2008 than the other counties. Bradford County experienced significant growth starting in 2009. Despite the late start, Bradford County quickly surpassed all other Pennsylvania counties with nearly 400 new wells drilled in 2011, for a total of 1,186 by June 30, 2013. Lycoming similarly experienced more new drilling activity in 2011 than occurred in the southwest and had the highest number of new wells drilled in 2012.

Figure 1 shows the cumulative number of wells drilled from 2005 to 2012 in each of the study counties. Although some wells may no longer be in production by 2012, and some have not yet been put into production, the lines reveal overall trends in the counties and across regions. The northern tier counties (Bradford and Lycoming) had steeper increases in the past 3 years, whereas those in the southwest (Washington and Greene) had more gradual but steady increases in the number of wells drilled.

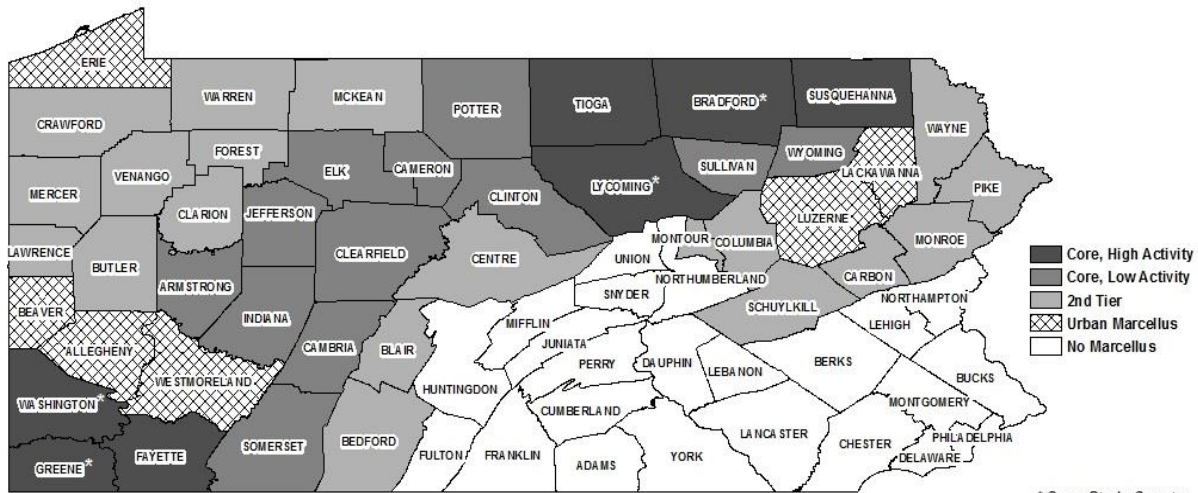


In 2012, the pace of new drilling slowed in Bradford and Lycoming, likely due to the declining price of natural gas. In contrast, drilling in Greene and Washington counties in 2012 was on par with the previous year. This may be because gas in southwestern Pennsylvania tends to be “wet” gas, meaning it contains more marketable compounds (liquid natural gases such as butane and propane) that can generate higher revenues than “dry” natural gas (i.e. methane) alone. Even so, mid-year figures suggest that new drilling activity across all four counties in 2013 may be comparable to 2012. A table listing well counts for all counties in Pennsylvania is in Appendix A.

Classifying Counties by Marcellus Shale Activity

To further understand the effects of Marcellus Shale activity, the analyses compared counties based on their level of Marcellus Shale activity using a five-category county typology. The typology was created by combining several definitions based on estimated shale value and actual development activity, including publicly available maps of the thickness, depth, and thermal maturity of the shale (McLaughlin et al., 2012). This typology also differentiates urban counties because the population and economic dynamics in these counties are fundamentally different from that of rural counties.

Figure 2. Marcellus Shale Typology



* Case Study County
 Typology based on the number of unconventional wells drilled through September 2012

In Pennsylvania, the number of wells is highly concentrated in a small number of counties. There are 7 counties (including the four study counties) that account for 90 percent of the total number of wells drilled through June 30, 2013. These 7 counties are classified as “core” counties with high drilling activity, and are shaded with the darkest gray in Figure 2. The other four typology categories are: “core” counties with low drilling activity, 2nd tier counties (with lower quality shale and limited drilling activity), urban counties with potential or some Marcellus Shale development, and those counties with no Marcellus Shale. For a full description of the typology, see Appendix B.

Local Governments and Marcellus

Local government officials are on the front lines of Marcellus shale development activity in Pennsylvania, providing important public services and infrastructure, planning for future changes within their community, and bearing responsibility for public health and safety. They serve a vital communication role between the gas industry and citizens, and are often the first entities notified when there is a problem. Local governments can be affected by unconventional shale activity in a variety of ways. The development activity can affect the demand for or use of public services that these governments provide, such as roads and other infrastructure, and emergency services. If the changes in demand or use are substantial, they may cause major financial implications for the local governments. The development activity also has the potential of impacting local government revenues, such as local tax collections, fees, and other income.

Two prior studies on how Marcellus Shale development is affecting local governments relied on a survey of officials across the entire Marcellus region (Kelsey and Ward, 2011), and a combination of focus groups and analyses of audit data from 2001 to 2009 in Susquehanna and Washington counties (Jacobson and Kelsey, 2011). These studies found rather mixed results. The majority (75 percent) of municipal governments with Marcellus Shale activity said that the development activity had not affected their tax or non-tax revenues, while about 18 percent said revenues had increased. About two-thirds of the governments with Marcellus Shale activity similarly reported that the public services they provided had not changed as a result of the activity (Kelsey and Ward, 2011). The statistical analysis of municipal spending and revenues in Susquehanna and Washington counties found no clear relationships with the level of Marcellus Shale activity in the jurisdictions. Their focus group participants, who were drawn from the analyzed municipalities, largely reported that they had not spent any additional monies on gas-

related issues. Both studies acknowledged that their analyses were relatively early in the development of Marcellus Shale, and that it was important to continue monitoring development to identify if or when impacts on local governments occur.

This research is intended to update the prior research by examining the experience of local governments with Marcellus Shale development to learn whether and how such development may be affecting local governments. This research draws upon two regional focus groups, interviews with county commissioners in the four case study counties, and annual audit data collected by the Pennsylvania Department of Community and Economic Development (DCED). Five county commissioners in the four study counties were interviewed individually, and an additional 10 municipal officials participated in regional focus groups (one in the southwest, and one in the northeast).

Methods

All county commissioners in the four study counties were invited to be interviewed. Five accepted the invitation. The research advisory committee helped identify potential focus group participants who worked for municipalities with a large number of wells in the two regions. The researchers tried to include a balance of participants across the two counties in each region. Invitations were sent to 14 potential participants in the northern tier, and 14 potential participants in the southwest. Both focus groups were held in mid-April 2013, and used a standard set of questions (see Appendix C).

The focus groups and interviews were recorded, transcribed, and coded. To remain consistent during the subjective coding process, the researchers used key phrases as they related to experiences common to the officials in the focus groups. For example, any mention of road damage was coded under “damage to existing infrastructure,” and any mention of new opportunities for work was coded under “job creation.”

Provision of Public Services

Local officials in each focus group most commonly identified road infrastructure as having been affected by the natural gas industry. Most of their comments were about damage to local roads as a result of gas development, such as from the increased traffic by heavy trucks hauling water, aggregate, and drilling equipment. The officials said many of the roads being used were not originally built to handle that kind of traffic.

They were clear that the municipal governments and taxpayers were not bearing the dollar costs to repair this damage because gas companies were repairing infrastructure at their own expense. Most officials said gas companies spent money to repair the damaged roads, and that this left the townships with better roads than they originally had. In addition, some gas companies put money into some town parks, as well as public services, such as animal shelters.

Several of the officials expressed uncertainty about the long-term financial impacts of the road damage and repairs, mostly focusing on what the long-term maintenance and snowplowing costs will be since these roads can be more expensive to maintain. They were concerned that taxpayers will be responsible for such costs after the gas companies leave.

The transient nature of the labor force was briefly mentioned by multiple officials, mostly relating to how it has resulted in a fluctuating population and thus caused some confusion and trouble in the housing industry. Some officials expressed concern that a great deal of the gas workers and truck drivers were from out-of-state, and, as a result, left fewer job openings for local residents.

Public Safety and Emergency Management

The public safety aspects of the increase in traffic associated with gas development were discussed in both focus groups, with many of those interviewed saying their municipalities had experienced substantial increases in the number of cars and trucks on the road. For example, one official said, “Here we are in a rural country area where you never had any influx of a thousand white pickups running around you every five minutes and the big trucks, and it became more of a headache... what can you do?” Several expressed concern about narrow public mountain roads in their jurisdictions, and that the increased traffic on the roads creates dangerous driving conditions, especially for out-of-state drivers of heavy machinery not accustomed to mountainous areas.

Focus group participants reported that police and emergency management services have been affected by the influx of new residents and increased traffic on the roads due to natural gas drilling. Littering by industry workers was a major grievance, according to some township supervisors. The officials also said they believe crime had increased, with the most common violations being associated with drugs or alcohol, such as DUI and actions taken while under the influence. One official said “They do party hard occasionally and we’ve got a few bars around but the best thing to do is to leave them alone. They’ll duke it out.” These perceptions of increases in crime were not completely substantiated in reported crime statistics (see Report #6 on crime). It may be that such localized changes in the number or type of emergency and public safety events are lost in the county-level crime data.

Industry/ Local Government Relations

Most of the officials present in the focus group meetings said that local governments were unprepared for the onset of Marcellus Shale activity, and that no one knew what changes to expect. They said that the public and local officials alike suffered a great deal of confusion and a lack of understanding in the early days of drilling activity. In some cases, township supervisors hardly knew that they were about to be affected by drilling; one township supervisor from Bradford County said he first learned of drilling in his township when a gas company “called that morning and said (the trucks with the drilling rig) were on their way” and would be there later that day.

Many of the officials said they have had to spend time learning about the implications of unconventional shale gas development, and that this is an on-going process of conversations with the gas companies working locally, and fielding questions from residents. As one supervisor said, “You’re constantly working on trying to keep yourself educated.” The officials brought up industry transparency, or a lack thereof, numerous times during both focus groups. Some of the officials related experiences in which they thought a gas company deliberately withheld or manipulated information to spin what was happening in the county in its favor. Officials, however, expressed a desire for transparency for the sake of local residents. Many of the officials said their local government was actively trying to help their residents understand what was happening and what to expect as a result of the gas industry’s presence. Yet they also stated that many of those residents were ill informed of the changes happening around them and how those changes would affect them.

The officials noted some gas companies have contributed money to the communities in which they drill, such as donating to local charities, to promote good relationships between the local community and the gas industry. The perceptions of the companies varied somewhat across the counties. In some areas, the officials viewed a specific company as beneficial to the community, whereas in other areas of the region, officials had a more negative opinion of the company. This suggests that local experiences, even of the same company, vary significantly.

County Budgets

Marcellus shale activity within a county can affect the county government's budget in a variety of ways. Property values can be affected positively or negatively by the activity, changing the county's tax base (and thus the amount of money that a given tax rate will generate). Changes in the number of people staying in local hotels can affect collections of the county hotel tax. Increased traffic can affect the need for bridge repairs, affecting the county's highway expenditures, which are mostly for county bridges, as the maintenance and repair of non-state roads in Pennsylvania is the responsibility of municipal governments.

County and municipal governments in Pennsylvania are required to have balanced budgets, in which their projected revenues match projected expenditures. Changes in the amount of money the commonwealth grants to county governments for human services, court administration, and other purposes can directly affect expenditures.

The researchers examined county government budgets for the four case study counties and their neighbors, using local audit report-based data released by DCED for 2007 and 2009 (at the time of this writing, the latter was the most recent year for which all county data were available). The audit data from Bradford County were not in this data set, which suggests that they either were not submitted to DCED or were not included in the state compiled data set.

Other than for the county hotel tax, there were no clear patterns in budget changes between the counties (see Table 3). Hotel tax revenues increased substantially more in Lycoming, Greene and Washington counties than in neighboring counties with less Marcellus activity. Several adjacent counties in the northern tier, including Susquehanna, Tioga, and Wyoming counties, similarly experienced large increases in hotel tax revenue. All three have relatively small populations, and have experienced significant Marcellus Shale activity. It is important to note that hotel tax revenue, by state law, can only be used for tourism-related purposes, such as tourism promotion and conference facilities.

Table 3. Change in County Government Revenues and Expenditures, 2007 to 2009

	Total Revenues	Total Expenditures	Total Taxes	Real Estate Tax	Hotel Tax	Government Administration	Highways
Northern Tier Region							
Bradford	*						
Lycoming	9%	-12%	2%	2%	28%	4%	18%
<i>Adjacent Counties</i>							
Clinton	-3%	9%	-6%	-6%	2%	4%	83%
Columbia	1%	4%	2%	2%	-9%	8%	
Northumberland	-9%	-5%	1%	1%	-3%	-11%	251%
Susquehanna	-12%	-13%	3%	2%	30%	4%	-86%
Tioga	-14%	-10%	4%	3%	30%	-23%	
Union	3%	-8%	14%	16%	2%	-5%	
Wyoming	-9%	-12%	12%	10%	26514%	-3%	
Southwestern Region							
Greene	-13%	-18%	4%	3%	42%	1%	-94%
Washington	0%	1%	5%	4%	35%	7%	8%
<i>Adjacent Counties</i>							
Allegheny	0%	1%	7%	-5%	-100%	12%	81%
Beaver	5%	13%	19%	19%	-6%	8%	15%
Fayette	-1%	2%	3%	-2%		-6%	4%
Westmoreland	-8%	-4%	2%	2%	1%	21%	

Source: PA DCED. Not adjusted for inflation. *Data for Bradford County for 2009 were missing from the DCED dataset.

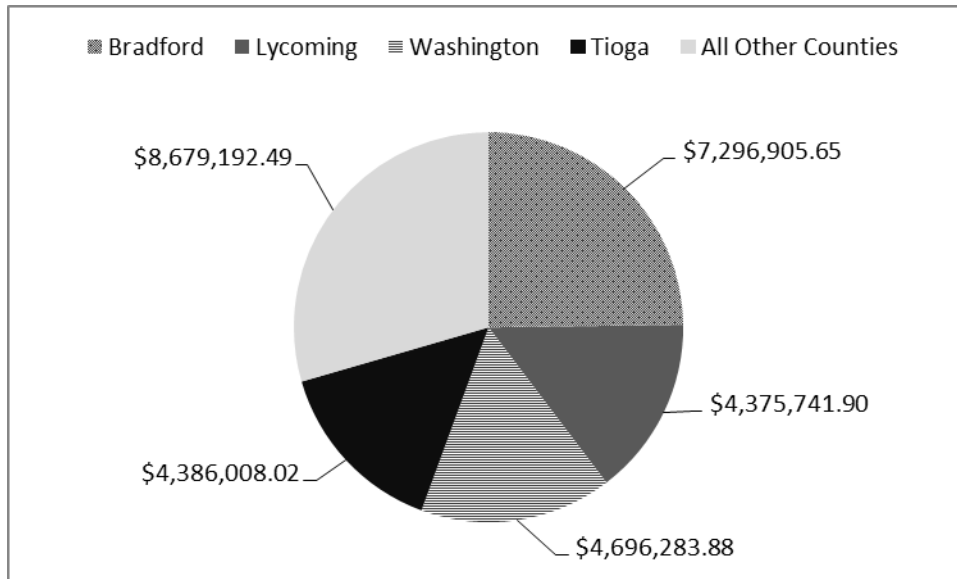
Act 13

As a result of Act 13 of 2012, money collected from impact fees is distributed to counties and townships across Pennsylvania with the goal of offsetting the impacts of drilling. According to a June 2013 Marcellus Shale Coalition press release, the “Marcellus Shale impact fee revenue has generated more than \$406,682,000 for the commonwealth and local governments,” with more than \$216 million being allocated to local governments and municipalities. Because the impact fee law was only passed in 2012, and because DCED’s release of local government audit data typically takes several years, it was not possible to examine how Act 13 dollars are affecting municipal and county budgets. Local governments are required to report how they spend their allocated money to ensure that impact fee money is being spent on approved items, and in the future this will be an important data source. Such reports by themselves, however, will provide an incomplete picture of how Marcellus Shale development is affecting local governments because it will not identify how much of the Act 13 dollars were simply substituted for existing local government spending, freeing up dollars to be spent on non-Act 13 areas. Therefore, it is critical that future analyses look at how entire budgets have changed in response to Act 13 dollars and not just the Act 13 dollars themselves.

According to focus group participants, many townships have chosen to spend the impact fee money on new equipment or new infrastructure to replace what had been damaged, directly or indirectly, by

drilling. Others are spending it on community projects. One focus group participant reported, “That impact money is wonderful. We’re going to get a community center, we’re going to get lots of things.” As of now, it is difficult to understand how they used those dollars and how those dollars may have impacted other spending.

Figure 3. Act 13 Impact Fee Dollars Received by County, 2012



Source: Pennsylvania Public Utilities Commission.

Other Observations

Public transportation was briefly mentioned in the focus groups. In the southwest region focus group, some mentioned that people have a hard time getting to gas industry jobs if they do not have a driver’s license because public transportation is not sufficient or convenient. So it may be that the lack of public transportation was impacting potential local employment with the gas industry.

Complaints about the noise and lights of the gas industry were mentioned in both the northern tier and southwest focus groups. A few officials in each of these groups mentioned the importance of preserving natural resources and wildlife in the affected counties. Air quality was mentioned numerous times, as focus group participants said their residents were concerned about the potential health effects of drilling.

It also became clear that past experience very much affects attitudes towards Marcellus Shale activity. Several of the township supervisors from Greene County said natural gas development is a positive compared to what has been occurring with coal development. One official said, “I have one industry over here taking and the other giving, per se, so I think it’s going to be a good balance to rebuild my community at the end of coal.” The supervisors particularly noted that when the subsidence associated with long wall coal mining in their jurisdiction damages property, the coal company often just buys the land, and the owners move away. They noted that, in contrast, any associated damage with Marcellus Shale development is repaired without losing residents. They characterized this as a positive for their community.

Concluding Remarks

The observations made by the focus group participants are perceptions based upon their experience with the natural gas industry in their roles as local officials. The government officials interviewed for this project expressed a wide range of emotions toward the natural gas industry as natural gas development is a complex issue with myriad implications and effects.

Focus group participants clearly asserted that the money generated by Act 13 has positively affected county budgets. However, Act 13 data were not yet readily available for analysis. Future studies that identify Act 13 expenditures may provide a better understanding of how these funds are impacting local government budgets and local communities.

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We gratefully acknowledge the members of our advisory committees who provided us with important insights at key points in the project and gave us access to data sets. We also thank the community members and county commissioners who shared their experiences through focus groups and interviews. We greatly appreciate their time, assistance, and insights.

References

- Dell, Ben P., Noam Lockshin, and Scott Gruber. 2008. "Bernstein E&Ps: Where Is the Core of the Marcellus?" Report published by Sanford C. Bernstein & Co., LLC, a subsidiary of AllianceBernstein L.P. New York, NY.
- DEP Office of Oil and Gas Management: Wells Drilled by County. Pennsylvania Department of Environmental Protection. <http://www.depreportingservices.state.pa.us/>. Accessed on July 4, 2013.
- Economic Research Service, USDA. 2013. Rural-Urban Continuum Codes: Documentation. <http://www.ers.usda.gov/data-products/rural-urban-continuum-codes/>.
- Jacobson, Michael, and Timothy W. Kelsey. "Impacts of Marcellus Shale Development on Municipal Governments in Susquehanna and Washington Counties, 2010." Penn State Cooperative Extension. Marcellus Education Fact Sheet. 2011.
- Kelsey, Timothy W., and Melissa M. Ward. "Natural Gas Drilling Effects on Municipal Governments Throughout Pennsylvania's Marcellus Shale Region, 2010." Penn State Cooperative Extension. Marcellus Education Fact Sheet. 2011.
- McLaughlin, Diane K., Molly A. Martin, April L. Gunsallus, Kathy Brasier and Kelly D. Davis. 2012. "Does Marcellus Shale Natural Gas Extraction Contribute to Increasing Inequality Among Pennsylvania's Families and Communities?" Paper presented at the Annual Meeting of the Rural Sociological Society, Chicago, Il., August.
- Social Explorer Tables: Census 2000 (SE), Social Explorer; U.S. Census Bureau. <http://www.socialexplorer.com/> Accessed on July 12, 2013.
- Wrightstone, G. (2008). Marcellus Shale Geologic Controls on Production. Texas Keystone Incorporated. http://www.papgrocks.org/wrightstone_p.pdf. Accessed on October 8, 2012.

Appendix A: Unconventional Wells Drilled by County and Year, 2005-2013

county name	2005	2006	2007	2008	2009	2010	2011	2012	2013*	Total, county
Bradford⁺	1	2	2	24	158	373	396	164	66	1186
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Lycoming⁺	0	0	5	12	23	119	301	202	89	751
Susquehanna	0	1	2	33	88	125	205	191	102	747
Greene⁺	0	2	14	67	101	103	121	105	54	567
Westmoreland	1	0	4	33	39	49	59	42	22	249
Fayette	0	2	6	20	57	44	54	43	12	238
Butler	0	3	12	11	10	35	35	69	44	219
Armstrong	0	3	2	7	19	36	35	44	26	172
Clearfield	0	0	1	6	24	39	58	19	2	149
Wyoming	0	0	0	0	2	24	71	15	25	137
Clinton	0	0	0	4	9	35	39	10	1	98
Sullivan	0	0	0	0	0	22	19	27	5	73
Potter	0	0	8	6	8	36	11	1	0	70
Elk	1	1	6	8	6	16	22	1	3	64
McKean	0	2	1	5	7	22	19	5	3	64
Centre	0	0	1	4	7	41	8	2	0	63
Indiana	0	0	0	5	6	7	21	2	0	41
Jefferson	0	0	0	3	3	7	15	9	0	37
Allegheny	0	0	0	1	3	0	5	13	8	30
Lawrence	0	0	0	0	0	0	2	16	8	26
Beaver	0	0	0	0	1	1	5	17	2	26
Somerset	0	0	1	0	7	4	7	5	1	25
Clarion	0	0	3	1	3	3	10	4	0	24
Forest	0	0	0	0	5	1	0	12	4	22
Cameron	0	0	0	3	2	3	7	0	0	15
Mercer	0	0	0	0	0	0	0	5	3	8
Cambria	0	0	0	0	2	1	3	1	0	7
Blair	0	0	0	0	0	4	2	0	0	6
Venango	0	0	0	0	0	0	2	3	0	5
Warren	0	0	2	0	0	0	1	1	1	5
Wayne	0	0	0	1	0	4	0	0	0	5
Columbia	0	0	0	0	0	1	2	0	0	3
Crawford	0	0	0	0	0	0	0	3	0	3
Lackawanna	0	0	0	0	1	0	1	0	0	2
Luzerne	0	0	0	0	0	2	0	0	0	2
Bedford	0	0	0	0	0	1	0	0	0	1
Huntingdon	0	0	0	0	0	1	0	0	0	1
Total, by year	8	36	115	335	816	1598	1963	1348	614	6833

Source: Pennsylvania Department of Environmental Protection, Office of Oil and Gas Management.

*Data through June 30, 2013 (accessed July 4, 2013). ⁺Study counties.

Appendix B. Marcellus Activity County Typology Definitions for Pennsylvania^a

Category	Geological Definition	Activity level	Counties
Core Counties with High Drilling Activity^b (N=7)	More than 50 percent of the land area is in the core Marcellus formation	Annual average 64 or more Marcellus wells 2005 to 2010	Bradford, Fayette, Greene, Lycoming, Susquehanna, Tioga, Washington
Core Counties with Low Drilling Activity (N=12)	More than 50 percent of the land area is in the core Marcellus formation	Annual average less than 64 Marcellus wells 2005 to 2010	Armstrong, Cambria, Cameron ^c , Clearfield, Clinton, Elk, Indiana, Jefferson, Potter ^c , Somerset, Sullivan ^c , Wyoming
Counties in the Marcellus 2nd Tier (N=19)	1 percent -50 percent land area is in the core <u>and</u> 25 percent or more land area is in the less viable areas (2 nd tier or gray areas in Figure 2)	Not applicable	Bedford, Blair, Butler, Carbon, Centre, Clarion, Columbia, Crawford, Forest ^c , Lawrence, McKean, Mercer, Monroe, Montour ^c , Pike, Schuylkill, Venango, Warren, Wayne
Urban Counties in the Marcellus Shale-- Core or 2nd Tier (N=6)	Marcellus Core or 2 nd Tier <u>and</u> identified as urban by the Center for Rural Pennsylvania	Not applicable	Allegheny, Beaver, Erie, Lackawanna, Luzerne, Westmoreland
Counties with No Marcellus Shale (N=23)	25 percent or less viable Marcellus land area or no Marcellus land area	Not applicable	Adams, Berks, Bucks, Chester, Cumberland, Dauphin, Delaware, Franklin, Fulton ^c , Huntingdon, Juniata, Lancaster, Lebanon, Lehigh, Mifflin, Montgomery, Northampton, Northumberland, Perry, Philadelphia, Snyder, Union, York
^a See McLaughlin, et al. 2012. ^b Note this category includes all four study counties. ^c These counties are excluded from those analyses that use American Community Survey (ACS) three-year estimates, as their populations are too small to be estimated.			

*For more on maps, see the Penn State University Marcellus Center for Outreach and Research (<http://marcellus.psu.edu>) and Dell, Lockshin, and Guber (2008).

Appendix C. Local Government Focus Group Protocol

- In what ways, if any, has the Marcellus shale development in this area affected municipal and county governments, and authorities (e.g. water and water authorities, etc.) in your region? (*changes in the size of population, demands for services and infrastructure, local government costs, local government tax and non-tax revenues, use of impact fees, community conflict, need for planning, etc*)
- How are municipal and county governments and authorities responding to these changes, if at all?
- What are some of the opportunities created for municipal and county governments and authorities?
- What are some of the challenges created for municipal and county governments and authorities?
- Of the specific challenges you mentioned, are there specific strategies to adapt to these that you see that seem to be working well?
- How do you think Marcellus Shale development will affect municipal and county governments, and authorities in the future? (longevity of these changes, potential reliance on impact fee dollars, future demands for services and infrastructure, ability to pay for those, etc.)
- How do you think Marcellus Shale development will affect residents and the community in the future?

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