Landowner Attitudes and Perceptions of Impact from Wind and Natural Gas Development in Northern Pennsylvania: Implications for Energy Landscapes in Rural America

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Landowner attitudes and perceptions of impact from wind and natural gas development in northern Pennsylvania: implications for energy landscapes in rural America

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Energy developments such as industrial scale wind farms and unconventional natural gas drilling represent some of the largest and most controversial land use changes occurring in the United States today. A diverse array of academic disciplines have each sought to explain the social, psychological, and economic effects of siting large industrial facilities in rural areas, however the research has largely remained discipline-specific. This study measures resident attitudes and perceptions of impact from both wind and gas drilling occurring simultaneously in the Armenia Mountain Area of northern Pennsylvania. The results of a mail survey of landowners (n = 1028) in this study area reveal factors that explain landowner variation in attitudes and perception of impact, and describe new forms of participation in the planning and siting of these energy projects. Direction is provided for a new and synthetic theoretical understanding of how residents perceive these impacts and impacts from land use change. The work advances “risk of social and psychological disruption” as a key factor that may influence how residents respond to the prospect of large land use changes. Implications for the regulation and planning of these energy sources are offered, including a new understanding of how landowners participate in the planning and siting of large energy projects. Finally, the limitations of this work, as well as opportunities and implications for future research, are discussed.

BIOGRAPHICAL SKETCH

Dr. Jacquet was born on July 20th, 1979 in Green Bay, Wisconsin. Raised principally in the Driftless Area of southwestern Wisconsin, Jeffrey earned a Bachelor of Arts degree in the field of Sociology from the University of Wisconsin-Milwaukee in 2001. In 2005, Dr. Jacquet graduated from the University of Wyoming with a Master of Arts degree in the field of Sociology. From 2005 to 2008, he worked as the socioeconomic impact analyst for a coalition of local governments in Sublette County, Wyoming, and has, since 2005, provided analysis and consultation to an array of governmental and academic organizations on the subject of socioeconomic impacts from energy development. From 2009 to 2012, Dr. Jacquet additionally served as an adjunct faculty member in the Department of Sociology at Corning Community College - State University of New York.

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Thank you.

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CHAPTER 1:

INTRODUCTION

Wind and natural gas energy developments represent some of the largest and most controversial rural land use transitions occurring in the United States today. Like many land use changes, the potential positive and negative impacts to local residents and communities are complex. Engaging social, economic, and environmental domains, the perception of these impacts engender local resident opposition to these developments and conflict over their siting. Despite the important role that impact perception plays in the siting process, very little research has been performed on the types of impacts residents perceive either before or after energy development takes place. Less research has examined factors that may influence why residents perceive these impacts or how this perception may ultimately result in support or opposition to these projects. The true scope of the research problem is complex, comprising the areas of sociology, psychology, and environmental planning.

While a good deal of academic research has investigated the social and ecological impacts from general land use change, the research is often disjointed and compartmentalized. The field of risk analysis, for example, has a rich and expanding history of examining the psychological implications of different types of residents responding to different types of threats from land use changes. The perception of risks from nuclear power plants or waste incinerators has been well developed, for example; however, the field has not yet addressed the many more subtle risks that may emerge from the siting of energy projects, especially projects potentially less catastrophic (such as natural gas or wind farms). Likewise, the field of rural sociology has examined, in sometimes great detail, the disruptions to social life caused by less-than-

catastrophic land use changes, but it has largely not utilized the prevalent and important risk analysis literature referenced above. Similarly, the field of urban and land use planning has examined the practice of planning and siting of these projects, and social-psychology has described the tapestry of meaning and identity that residents imbue on these local communities and locales. Yet, rarely have these fields shown collaboration in the realm of energy development.

Thus, this research advances the theoretical understanding of resident impact perception of energy development and land use change by developing a framework of "the social at risk" that combines aspects of rural sociology, environmental psychology, risk communication, land use planning, and social impact assessment. There are many common themes to these disparate strands of academic inquiry, and this research exploits these commonalities to paint a more comprehensive, integrated picture of how the development of wind and natural gas energies impact rural areas of the United States.

The core methods of this dissertation involve a household mail survey administered in the spring of 2011 that measures the impacts residents perceive from industrial scale wind and natural gas developments that are occurring simultaneously in the Armenia Mountain region of Northern Pennsylvania. These perceived impacts are conjoined in a comparative analysis of the impacts and implications for cumulative types of change. The findings are measured against crucial resident attributes, including resident proximity to the developments, landowner and leasing status, length of residency, and acreage size, as well as measures of resident attitudes, such as levels of support or opposition to the projects overall, measures of environmental and community identities, and resident attitudes toward and participation in local siting and planning procedures.

It is possible that this research can claim many "firsts:" the first time wind and natural gas development are studied simultaneously in the same research setting; the first time geographical proximity to unconventional natural gas development is studied in relation to resident attitudes and impact perception; and, at least in the United States, the first time that threats to the social order posed by wind farm development are studied in detail.

This dissertation also includes an expanded discussion on the theoretical and practical implications of blending the fields of sociology, land use planning, social psychology, and risk analysis. Studies of impacts from energy development have independently noted that "social disruption" (i.e. disruptions to social processes, hierarchies, community identities, and resident attachments thereto) and "place disruption" (i.e. disruptions to aesthetic, environmental and geographical identities, and resident attachments thereto) are key impacts experienced by residents near energy development(s). How residents assess the threat (or risk) of impacts to these social and psychological attributes is an important and overlooked factor in the siting of large industrial facilities. In the field of risk perception, it is commonly accepted that people fear disruption or change to values that they hold dear, and it is likewise accepted in the social sciences that people cherish and value social and psychological identities. It is therefore reasonable to assume people may fear risks to these social and psychological values, and such risk perceptions may strongly contribute how they evaluate and react to large technological land use changes such as energy development. Furthermore, research has shown that the risks that residents perceive from industrial development can be influenced by the media, social institutions, and the planning and siting process. Therefore it follows that "risk of place/social disruption" may in itself be perceived by local residents, mediated and amplified by social institutions, and act as a basis for local opposition.

1-1.1 Statement of Research Problem

Rising energy prices, technological innovations, incentives to reduce carbon dioxide gas emissions, and a push for energy independence have hastened the construction of new energy projects across the United States. Among the most prevalent of these emergent energy developments are the widespread construction of wind farms and natural gas fields. The development of both wind and natural gas is dependent on the industrialization of large swaths of rural landscape: each requires a dispersed array of approximately 5-acre industrial lots that are interconnected by access roads and energy transmission lines. Recently these projects have experienced explosive growth in rural areas of the eastern United States characterized by relatively high population density and smaller acreage landowners. Both types of energy development have vast potential for growth in the coming years, and may very well represent among the largest land use changes currently occurring in the rural United States.

Local opposition remains among the largest roadblocks to industrial wind development in the US and worldwide. Government entities – from towns in New York and Pennsylvania to the countries of France and Germany – continue to enact bans on gas drilling activity within their jurisdictions. While it is clear that some residents very much oppose wind and/or gas developments, other residents clearly support one or both of them. Such developments have actual positive and negative socioeconomic impacts on local residents and communities, and that these impacts are not likely to be distributed evenly among the local population. Yet despite the construction of tens of thousands of new gas wells and tens of thousands of new wind turbines in the US over the past few years, these impacts are neither well documented nor well understood. Critically, how or why residents perceive these impacts or the threat of future impact has received even less attention.

1-2 Research Questions and Hypotheses

This research is concerned with several suites of interrelated questions, both theoretical and applied. The theoretical and research basis for these questions is outlined in the subsequent chapters, and need not be repeated here. However, along with these research questions are corresponding hypotheses that drive this research, many of which are not are provided in subsequent chapters. Accordingly, these are described below:

Question Suite 1:

What are the effects that residents perceive from wind and natural gas development? Are these effects social, economic, or environmental in nature? Which are seen to be positive and which are seen as negative? Do the impacts or level of positive/negative-ness differ for wind and natural gas? Are these impacts cumulative in nature between gas and wind?

Hypothesis 1a: Residents largely see economic impacts from gas drilling and wind farms as positive, while social and environmental impacts are seen as negative.

Hypothesis 1b: Residents will view economic impacts from gas drilling as more positive than the wind farm, and environmental impacts as more negative.

Question Suite 2:

What factors influence the impacts that local residents perceive? What factors influence how residents view an energy development positively or negatively? For example, do residents' perceptions of local aesthetic quality, and the role that aesthetic quality plays in their sense of place, influence the level of perceived aesthetic impact from energy development? Can royalties be viewed as positive even if the resident does not receive them?

The obvious follow-up questions are “how and why?”: What are siting and construction actions and protocols taken by wind and gas developers (either voluntarily or by law), and how do they effect the perception of impacts?

H2a: Proximity is a key factor that influences perception of aesthetic and environmental impact.

H2b: Residents who value environmental place meanings, and with greater environmental attitudes overall, will perceive a greater environmental impact from energy development.

H2c: Residents with stronger place attachment will perceive greater negative aesthetic and social impacts.

Question Suite 3:

How does the perception of specific impacts influence the overall level of support or opposition to the project? Which impact domains are most important in fostering overall support or opposition? For example, are people that perceive negative environmental impacts more likely to oppose the development that people perceive negative social impacts? What about positive impacts?

H3a: Residents who perceive greater positive economic impacts will be more likely to support the development.

H3b: Residents who value environmental place meanings, and with higher environmental attitudes overall, will be more likely to oppose the development.

H3c: Residents with higher place attachment will be more likely to oppose the development.

Question Suite 4:

How can the implementation of future energy developments be designed to lessen the perception of negative impacts, and improve the perception of positive impacts? Are there specific actions or protocols that are taken or could be taken by energy developers to mitigate the perception of adverse impacts?

H1a: Resident perceptions of the siting and regulation process of the development will be related to overall levels of support, suggesting that better siting and planning protocols that harbor feelings of trust, justice, and inclusiveness can influence positive attitudes.

1-3 Contents

This dissertation is formally comprised of a series of 4 research papers which have either been or will be submitted to academic journals. The following is a brief summary of these papers.

Chapter 2: "Environmental concern and industry experience: landowner attitudes toward natural gas and wind farm development in northern Pennsylvania."

This paper engages the recent literature on wind farm siting and the use of NIMBY (not-in-my-backyard) mentalities to explain resident attitudes towards energy development. It offers a more general description of the findings of the mail survey, including residents' overall attitudes towards wind and natural gas development, how those attitudes have changed over time, and how they compare with attitudes towards the general use of those types of energy development in general. The paper focuses on the effect of proximity, environmental attitudes, industry employment, and leasing

experience on resident attitudes towards the two energy developments occurring in the Armenia Mountain Area. Recommendations for energy policy and future research are also discussed.

Chapter 3: "The risk of social-psychological disruption as an impact of energy development and environmental change"

In this paper, a theoretical, literature-based argument is advanced for the study of social and psychological disruption under the rubric of risk analysis, especially in the face of proposed land use changes such as energy development. The paper—via a thorough review of extant literature— attempts to link the disparate fields of environmental planning, rural sociology, risk analysis, and social psychology through a lens of how attachment and community- and place-based identity may drive oppositional behavior to large land use changes. It is posited that the risk or threat of social and psychological disruption has been documented as among the most troublesome aspects of large development projects, and social actors strive to influence residents' perception of these social-psychological risks. The paper advances the use risk analysis tools to measure and predict these types of disruptions to community and place-based identities.

Chapter 4: "Perceived Impacts from Wind Farm and Natural Gas Development in Northern Pennsylvania"

This paper compares, in detail, the environmental, social, and economic impacts perceived by landowners from the development of the wind farm and the extensive natural gas drilling occurring in the Armenia Mountain area, utilizing data from the survey effort. This effort draws largely from the practice of social impact assessment, and the detailed types and magnitudes of perceived impact are grouped into categories via factor analysis and compared against wind and natural gas development. The perception of these impacts is used to explain

overall attitudes towards natural gas and wind power via multiple regression analysis. Residents' place meanings for the area, their level of place attachment, and length and type of residency are additionally used to explain impact perception and attitudinal variations.

Chapter 5: "Local control over energy development: the rise of "private participation" in the planning of energy projects in the rural United States."

Largely engaging the literature surrounding the planning and siting of land use projects and the implications for deliberative democracy, the paper discusses the ramifications of participation in the planning process siting process by large segments of the population that occurs outside of the public sphere, via privately negotiated contracts (i.e. leases) with energy firms. Other segments of the population are largely disenfranchised as they have little opportunity to participate in the public deliberation process. This paper also discusses the uneven regulatory authority of local governments and municipalities in the planning and siting of natural gas and wind farm projects in the United States, and uses the Armenia Mountain region as a case study of this unevenness.

1-4 Intentions of this Research

The findings of this research will aid communities, regulators, and energy developers in the planning and siting of wind and natural gas developments, as well as aid researchers in the theoretical analysis and understanding of resident impact perception and attitudinal behavior. More specifically, this research is to: 1) measures and assesses the "on the ground" impacts perceived by individuals near wind and gas developments, to describe how perceived impacts from wind and gas differ, and to provide an assessment of factors that may explain the composition of these perceptions; 2) examines factors that explain differences in overall attitude towards these energy developments; and 3) provides direction for a new and synthetic

theoretical understanding of how residents perceive these impacts and impacts from changes in land use in general.

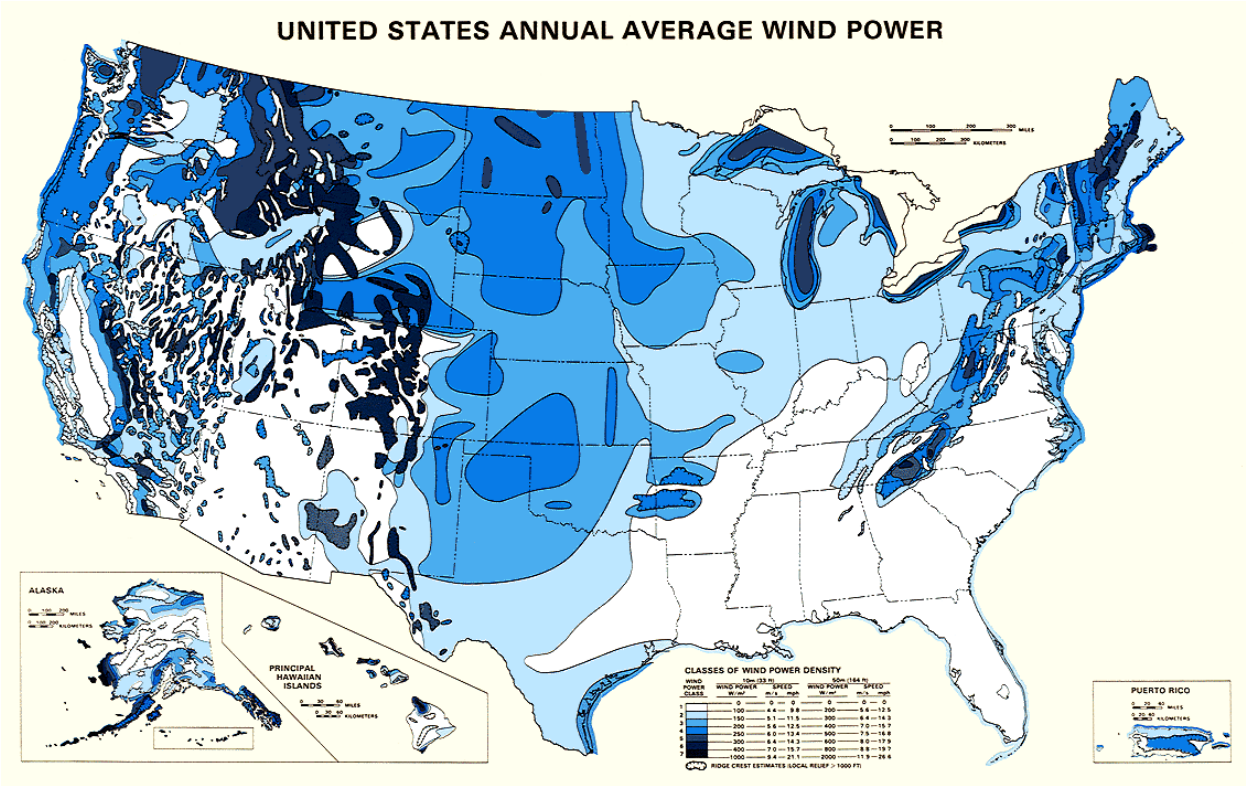

Figure 1-1: A depiction of the wind resource available for wind energy production in the United States. Darker blue areas represent greater resource. Source: NREL

Analyzing the synergistic impacts of both wind and natural gas occurring at the same place and time will offer many new opportunities for comparative and cumulative impact assessment and analysis. No studies to date have measured the perceived impacts on social, environmental, and health attributes across these two different yet simultaneous developments. As wind and natural gas co-expand across many rural areas of the United States, such a research design has the opportunity to advance future impact assessment, potentially informing the regulation and management of these energy developments, especially in areas where they are increasingly in nearby locations. The particular effects and issues at play in energy

development and land use change remain local, however the methods of measurement and theory advanced here – and, to some extent the results of this survey – can be applied in other contexts involving energy and land use change as a whole, especially areas similar to this research site that are rural, contain environmental amenities, and are undergoing multiple forms of technological land use change. The results of the survey, as with many locality-based survey efforts, are partially context specific in that regional cultures, histories, sources of information, and demographic patterns may influence the results. However, the methods and theory are likely widely applicable to many different locations and endeavors.

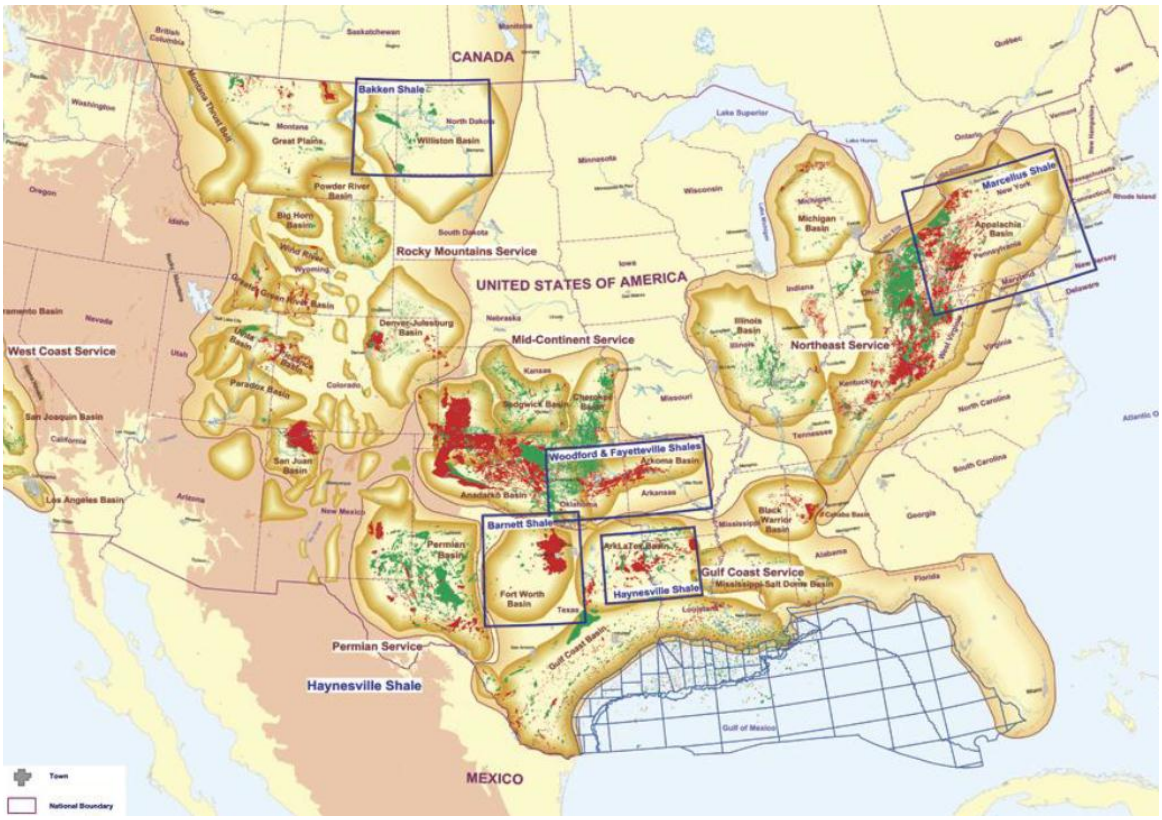

Figure 1-2: A map depicting oil and gas wells drilled in the United States. Source: ESRI

1-5 Conclusion

Taken as a whole, this research uses an integrated framework for measuring and analyzing the impacts to residents from industrial development. It bridges the gap between the descriptive and investigative socioeconomic nature of Social Impact Assessment with the causal social mechanisms studied via risk analysis, while still acknowledging the importance of socially-constructed meanings of place and community can have on the perception of impact and attitudes toward development.

This research has implications for the analysis and management of other types of land use changes as well: social, community, and place-related attributes can be put "at risk" by other land use actions ranging from shopping mall developments to national defense instillations. NIBMY and industrial siting literature typically focuses on (and how to overcome) local opposition to a project; critically, NIMBY literature often does not address either a) the reasons that have led residents to oppose the project in the first place and b) local residents who are actually in favor of the project, and why these residents have come to different conclusions. This research will help to answer these important questions. To be able to quantifiably measure risks to the social fabric, and compare the perception of impacts from different energy developments among different residents, all the while sorting against different geospatial and attitudinal characteristics can help provide important contributions to the study of energy development and land use change.

CHAPTER 2:

LANDOWNER ATTITUDES TOWARD NATURAL GAS AND WIND FARM DEVELOPMENT IN NORTHERN PENNSYLVANIA.

Abstract

The United States has undergone a recent boom in the development of onshore wind farm and natural gas energy projects and contentious debates over the construction of these projects are common in communities across the United States. A survey of landowners in a region of Northern Pennsylvania (N = 1028) undergoing simultaneous development of both wind and natural gas development shows that landowners are generally much more polarized and negative towards gas development than wind farm development, and that attitudes toward natural gas development is highly dependent on environmental attitudes and industry leasing, development, or employment experience. Landowner proximity to the development explains a small amount of the variation in attitudes towards wind energy. Recommendations for energy policy and future research are discussed.

2-1. Introduction

Driven by technological innovations and high energy prices, the United States has undergone a recent boom in the development of onshore wind farm and natural gas energy projects. According to federal databases, 20,410 industrial-sized wind turbines and 190,679 conventional and unconventional natural gas wells were constructed onshore between 2000 and the end of 2009 (ORNL, 2011; US EIA, 2011a). Despite this growth, gaining acceptance of these energy projects from local residents is often difficult. In the US, local municipalities

control planning and siting of wind energy in many areas, while the ability of local authorities to approve or deny natural gas development has been increased by court decisions in recent years (Barnes and Pardo, 2012; Kenneally and Mathes, 2010). Many communities in New York and Pennsylvania, for example, are now enacting bans on gas and/or wind developments, and contentious debates over the construction of these projects are common in communities across the United States. Wind and gas industry proponents often cite local opposition as among the largest impediments to development, and a recent study found that over 45% of proposed wind projects in the US have been blocked at the local level (Pociask and Fuhr, Jr., 2011).

Existing research on resident perceptions of energy development and other land use changes has tended to characterize local attitudes as a phenomenon of NIMBY (Not-In-My-Back-Yard), whereby residents who would otherwise support such projects tend to oppose them when they are sited in close proximity (Schively, 2007). More recently, public debate in the US around energy development has largely characterized landowners who have the potential to receive direct benefit (in the form of lease payments and royalties for energy production) as vehement supporters of energy development and those who will not receive such benefits (because they do not own land that is suitable for energy development) as chief opponents of the activity (Jacquet and Stedman, 2011).

Despite the boom in development and the controversy it has produced, relatively little empirical research has focused on resident attitudes towards wind and gas development. Furthermore, the effects of landowner compensation or resident proximity (despite the NIMBY assumptions articulated above) remain largely untested.

Natural gas development has been buoyed by the emergence of “unconventional” gas formations that rely on advanced horizontal drilling and high-volume hydraulic fracturing (or “fracking”) technologies. Unconventional gas resources already account for 50% of US natural

gas production (US EIA 2011b) and the world-wide potential for the growth of unconventional gas development is very favorable (Paltsev et al., 2011.), with terms like “paradigm shift” and “game changer” used to describe its potential (Newell, 2010). Wind energy development in the US has recently ebbed with the economy, however the US remains one of the world’s largest installers of onshore wind capacity, and it is expected that onshore wind farm construction rates will more than double if the US is to meet policy initiatives such as the 20% Wind Power by 2030 proposal (USDOE 2008; NRC 2010).

Furthermore, future efforts to combat climate change caused by green house gas emissions will likely hasten both types of energy development as they are often depicted as medium- to long-term solutions to this problem: wind typically is described as a source of carbon-free “green energy” (Warren et al., 2005), while natural gas is often referred to as a reduced-carbon “transition-fuel” (Hultman, et al., 2011; Paltsev et al, 2011) although the amount of greenhouse gas emissions from unconventional natural gas development is increasingly contested (Stephenson et al, 2012).

Despite these purported global environmental benefits, both wind and natural gas projects are often opposed on environmental concerns at the local level (Groothuis et al. 2008, Warren et al., 2005). The natural gas and wind industries share a large number of land use and developmental characteristics, as both appear in largely rural areas as dispersed arrays of several-acre development sites connected by transmission lines and access roads, both energy sources are seen as contributing to the larger phenomenon of “energy sprawl” (Johnson, 2011; McDonald et al., 2009). Within both industries, the development sites are typically leased from a multitude of private landowners and the landowners are additionally paid a royalty for energy that is produced. Both energy sources exhibit a short but industrially-intensive construction phase followed by several decades of a relatively temperate energy production phase, and both

gas and wind have been looked upon as drivers of economic growth and prosperity in rural areas (Kelsey et al, 2011; Slatterly et al., 2011).

Much of the wind and natural gas development in the US has historically occurred in less-populated central and western regions: how and why local residents perceive of the positive and negative impacts from these energy developments – and ultimately support or oppose the projects – will become even more critical as these energy projects continue to expand into higher density and more privately-owned areas of the eastern US.

It is becoming increasingly common for wind and natural gas developments to be sited in close proximity to each another – with multiple examples in Texas, Wyoming, Colorado, Pennsylvania, and other places. While both industries share a number of similarities in land use, there are clearly opportunities for difference in how residents perceive of these energy sources. Wind energy is primarily noted for its aesthetic impact on rural landscapes, while local environmental concerns (especially the impact on local drinking water) have come to dominate discussions on natural gas drilling.

This article describes the results of a 2011 mail survey measuring landowner attitudes toward both wind farm and natural gas development occurring simultaneously in the greater Armenia Mountain area of north-central Pennsylvania. The area has experienced heavy natural gas development since 2009, a 67 turbine wind farm was constructed there in 2010, and 56 more turbines are scheduled for construction in the near future. Survey results of landowner attitudes are measured against proximity to the developments, the reception of lease payments and production royalties, environmental attitudes, and how residents view wind development as compared to natural gas.

2-2. Understanding Resident Perceptions of Energy

2-2.1 NIMBY

Existing research on resident perceptions of land use change has tended to characterize local attitudes as primarily related to the resident's proximity to the development. The concept of NIMBY has gained wide acceptance in the industrial siting, land use planning, and risk perception literatures since the early 1980s (Schively, 2007). Increasingly, the NIMBY framework has been derided by researchers, especially in the realm of wind farm developments, with many viewing it as a pejorative concept ultimately too simplistic and dismissive to take into account the complex range of attitudes held by residents confronted by new industrial land uses (Wolsink, 1994; Warren et al., 2005; Jones and Eiser, 2009). While distance to the development is clearly a central theme in the NIMBY construct, it is unclear at what geographic scale proximity should be measured (Michaud et al., 2010). Furthermore, Devine-Wright (2009:431) notes, "the NIMBY concept unhelpfully muddles whether opposition should be conceived as a belief or attitude towards a development, a behavioral response taken by individuals or the collective actions of organized groups."

It has also been pointed out that resident perceptions may change – even dramatically – before, during, and after construction of a project and that the NIMBY concept typically fails to explain such temporal variation (Jenkins-Smith et al., 2009; van der Horst, 2007). Some researchers have suggested that NIMBY-type attitudes or behaviors might best be explained by other factors, including resident attachment to place-based identities (Devine-Wright, 2009), political or environmental attitudes (Michaud et al, 2008; van der Horst, 2007), or perceptions of procedural fairness (Gross, 2007).

Research on wind farms in Europe has even shown a "reverse NIMBY" phenomenon whereby residents closer to the installations actually support the project more than do residents

who are located further away (Braunholtz, 2003). Conversely, other studies on wind farms in the U.S. have found the more traditional NIMBY finding that close proximity correlates with negative attitudes, but found that proximity only accounts for a small amount of the variation (Swoffard and Slatterly, 2010; Johansson, 2007). Few concrete explanations have been offered for the "reverse NIMBY" phenomenon where it exists, although one hypothesis suggests that residents closer to the energy project are more likely to perceive the project's benefits of royalties and employment, even if they are not direct recipients. Research on Scottish wind farms by Braunholtz (2003) suggests an expectation-based explanation for the reverse-NIMBY phenomenon: residents closer to the wind farm found the negative impacts not as severe as their expectations, and thus ultimately feel more positive about the development than do people located further away.

Less research has been performed on attitudes towards natural gas drilling and either proximity to development or environmental attitudes. A notable example is a study by Michaud et al. (2010) that measured the effect of proximity and environmentalism on resident attitudes towards off-shore oil drilling in California and Alaska, and found strong evidence that environmentalism influences attitudes towards oil drilling, but that proximity seemed to have no effect.

2-2.2 Wind Farm Development

Wind farms are noted for their aesthetic impact, as the large industrial towers can dominate the viewsheds in the areas where they are sited, often because the places where the wind resource is most attractive (ridgelines, coastlines, etc.) are also the areas where the large towers are the most noticeable (Johansson, 2007). The effect on nearby property values has also been noted as a concern amongst landowners (AGO, 2009), although a nation-wide study on the sale of 7,500 single family homes situated within 16 km of a wind farm found no

conclusive evidence of any widespread positive or negative impact on property values (Hoen, et al., 2009; 2011). The effects of low-frequency wind turbine noise have gained greater prominence as of late, and several scientific studies have found small but significant minorities of nearby residents report stress and sleep disturbance from turbine noise, although more serious health effects from turbine noise have not been scientifically supported (Bolin et al., 2011).

Several studies on wind farm developments have shown that positive attitudes towards wind energy decline after a wind farm is proposed and during the construction phase, but that attitudes become much more positive after construction is completed (Devine-Wright, 2005; Wolsink, 2005). As described previously, the environmental impacts from wind farms are complex, and the effect of environmental attitudes on resident perceptions of local wind energy projects can be difficult to determine, as both opponents and supporters can "claim the mantle of environmentalist" (Groothuis, et al., 2007:1545). However, it is clear that local environmental costs, and global environmental benefits, are both strong factors that environmentally-minded residents use to form their opinions (Wolsink, 2005).

2-2.3 Natural Gas Development

A significant body of research on natural gas drilling has emerged since the 1970s, although the majority of this research has focused on municipal and social effects of rapid population growth in rural areas from the influx of natural gas workers, with much less focus on the effects of environmental or land use change (Jacquet, 2009). A number of studies have surveyed residents in communities that have experienced natural gas or other kinds of fossil fuel energy development and found that residents were typically more optimistic about economic benefits in general (especially prospects for employment within the industry) before development and that such positive attitudes waned once development occurred (Thompson

and Blevins, 1983; Brasier et. al., 2011a; Murdock and Leistritz, 1979; Anderson and Theodori, 2009). Some longer-term longitudinal studies have looked at temporal changes in resident attitudes and found residents held the most negative attitudes during the height of the development, and that attitudes became more positive in the post-development period, although did not ultimately reach pre-development levels (Brown, Dorius, and Krannich, 2005).

Unconventional natural gas development and the associated horizontal drilling and high-volume hydraulic fracturing technologies have been widely used in the United States in places such as Texas, Wyoming, and Colorado since the late 1990s. Since 2009, gas development has occurred in the Marcellus Shale formation in the eastern United States, which is characterized by a much higher population density and a regional lack of historical knowledge of natural gas operations compared to that of communities in the western US. Much of the public policy debate over gas drilling in recent years has centered around the health and environmental risks gas drilling pose, especially risks to drinking water, and the risk from chemicals used in the hydraulic fracturing process (Wiseman, 2011; Colborn, et al., 2011). Scientific research on the environmental and public health impacts of natural gas drilling is lacking, and research on resident perceptions of these aspects is even more difficult to obtain. In 2009, a mail survey was conducted across Pennsylvania and New York State – before wide-scale drilling had occurred in most areas – and pluralities of the 1,917 respondents reported they expected gas drilling to provide positive economic impacts, negative environmental and municipal impacts (including an expectation that drinking water quality will "get worse"), and little social impact of any kind (Stedman et al., 2011: Brasier et al. 2011b).

2-2.3 Economic Compensation and Experience with Development

Landowners have two main opportunities for payment from either wind or natural gas development: leases and royalties. Wind or gas company representatives will approach

landowners about leasing their property; such a lease includes a per-acre fee the company pays the landlord regardless of whether development takes place, as well as terms that dictate the development guidelines and royalty payments if the energy company chooses to develop on the property. The leases are legal contracts that often remain in effect for 5 or 10 years, and landowners have begun to form coalitions for the purpose of leveraging large amounts of collective acreage for favorable leasing terms from energy firms (Jacquet and Stedman, 2011; Liss, 2011). If the company decides to develop on the leased property, development proceeds according to the terms of the lease, and a royalty (a percentage of the profit from the sale of the energy) is paid to the landowner, and the landowner is also typically compensated for disturbance to farming operations or landscapes. After development occurs, the lease remains in effect for as long as energy is being produced.

Public debate over the benefits and costs of natural gas development is often characterized as a "have vs. have-not" debate between landowners who may receive direct benefit from lease payments and royalties, and those who will not receive such benefits, yet may bear the costs of traffic, industrialization, and possible environmental or health effects (Jacquet and Stedman, 2011).

Little or no research has been performed on the percentage of landowners who have wind or natural gas leases, or the actual amount of compensation paid to landowners from either leasing or royalties. While the terms of an energy lease is considered public information in the US, such data has largely not been aggregated or digitized, and thus obtaining the information requires performing an extensive manual search of property records at local government offices. Paying teams of personnel to perform such searches is a part of doing business for energy firms, however the results are closely guarded.

However, anecdotal evidence suggests that payments from natural gas development operations dwarf those paid by wind farm development, especially during the first several years of development (Smith, 2011). Unconventional natural gas wells are characterized by their tremendous return of gas during the first several years of production, after which production declines precipitously (MIT, 2010).

Even without direct compensation, residents may perceive positive economic impacts to themselves or to the community from the development. Yet, surprisingly, little or no research has compared the attitudes of landowners who receive leasing or royalty payments from gas or wind energy development to those who do not receive such payments.

A related concept in the realm of facility siting and land use planning is the use of economic compensation to influence resident attitudes among those negatively impacted by development. Determining the method and proper amount of compensation, as well as deciding who is or is not compensated has made economic compensation impractical in many land use contexts (Schively, 2007). Groothuis et al. (2008) found that, in a hypothetical scenario, residents in North Carolina were willing to accept a local wind farm development if they were economically compensated, and residents who had recently retired to the area required more compensation while residents with greater concern for the environment required less (presumably because they saw construction of the wind farm as environmentally beneficial). But research on industrial facility siting has shown that economic compensation may not be successful unless residents believe the developer has also taken steps to directly reduce the negative impacts and that they believe the siting process to be fair and trustworthy (Chung, Kim, and Rho, 2008).

2-3 Research Objectives

To date, only a handful of studies in the US have looked at resident attitudes toward wind development and little or no research has examined wind and natural gas in the same context. Nor is research available that measures how resident attitudes toward energy development is related to the potential for leasing or royalty income, or how environmental attitudes inform the perception of multiple forms of energy development occurring in the same area.

The primary research questions explored in this paper are: 1) what is the relationship between resident proximity and attitudes toward wind and natural gas development; 2) to what extent does economic compensation from leasing, royalties, or employment correlate with attitudes toward energy development; 3) to what extent do environmental attitudes predict attitudes toward energy development? 4) in what ways do these questions, and resident attitudes generally, differ across wind and natural gas development?

2-4Methodology

2-4.1 Research Location

Armenia Mountain is a highly-visible mountain ridge located in the Endless Mountains region of northern Pennsylvania, within Tioga and Bradford Counties (figure 1). The ridge and the surrounding 16km were chosen because they both contain intensive natural gas development and a large wind farm facility, as well as plans for additional gas and wind development. The area is a diverse mix of small towns, agricultural lands, and amenity-rich natural areas, offering variation in land use and residency.

Approximately 10,000 people live year-round within 16km of the wind farm, including within 6 small towns or boroughs (U.S. Census Bureau, 2011). The largest is the town of

Mansfield, home to Mansfield University and a population of 3,625, while the second largest town, Troy, had a 2010 population of 1,354. Armenia Mountain itself (the area of the ridge) is among the most rural areas of Pennsylvania, largely comprised of vacation homes, hunting cabins and unimproved tracts of land connected by gravel roads, with a total year-round population of 180 in 2010.

Like much of the northeastern United States, the area is experiencing a trend of afforestation as agricultural use declines (NYSDEC 2010). While the immediate area around Armenia Mountain has had a primarily agricultural past, the larger region is often considered part of the post-industrial Rust Belt, and has largely suffered from poor economic conditions during the latter half of the twentieth century (Thomas and Smith, 2009). The population of Tioga and Bradford Counties decreased by 0.6% between 1980 and 2010 (U.S. Census Bureau, 2011). Tourism remains an important contributor to the economy, especially for hunting and fly-fishing seasons, and nearby Pine Creek Gorge (often marketed as "the Grand Canyon of Pennsylvania") attracts visitors of all types, although there are concerns that gas drilling activity, and the associated limited availability of vacant motel rooms, is having a detrimental effect on the tourism industry (Rumbach, 2011).

Wind Farm

Atop the Armenia Mountain ridge is the Armenia Mountain Wind Farm, operated by international energy firm AES, consisting of 67 1.5 MW wind turbines with an average height of 118m that were formally proposed in 2007 and were constructed in 2009-2010, along with several substations, over-ground and under-ground transmission lines, meteorological towers, and approximately 25km of access roads. The wind farm area in total is approximately 10,000 acres, a patchwork of primarily forested areas intermixed with hay fields and pastures, and land ownership is comprised of 117 private parcels under lease by AES (AES, 2007). AES

additionally gained approval for the construction of a second phase of development – consisting of an additional 56 turbines – but company officials have recently stated that Phase II is currently on hold during the economic recession.

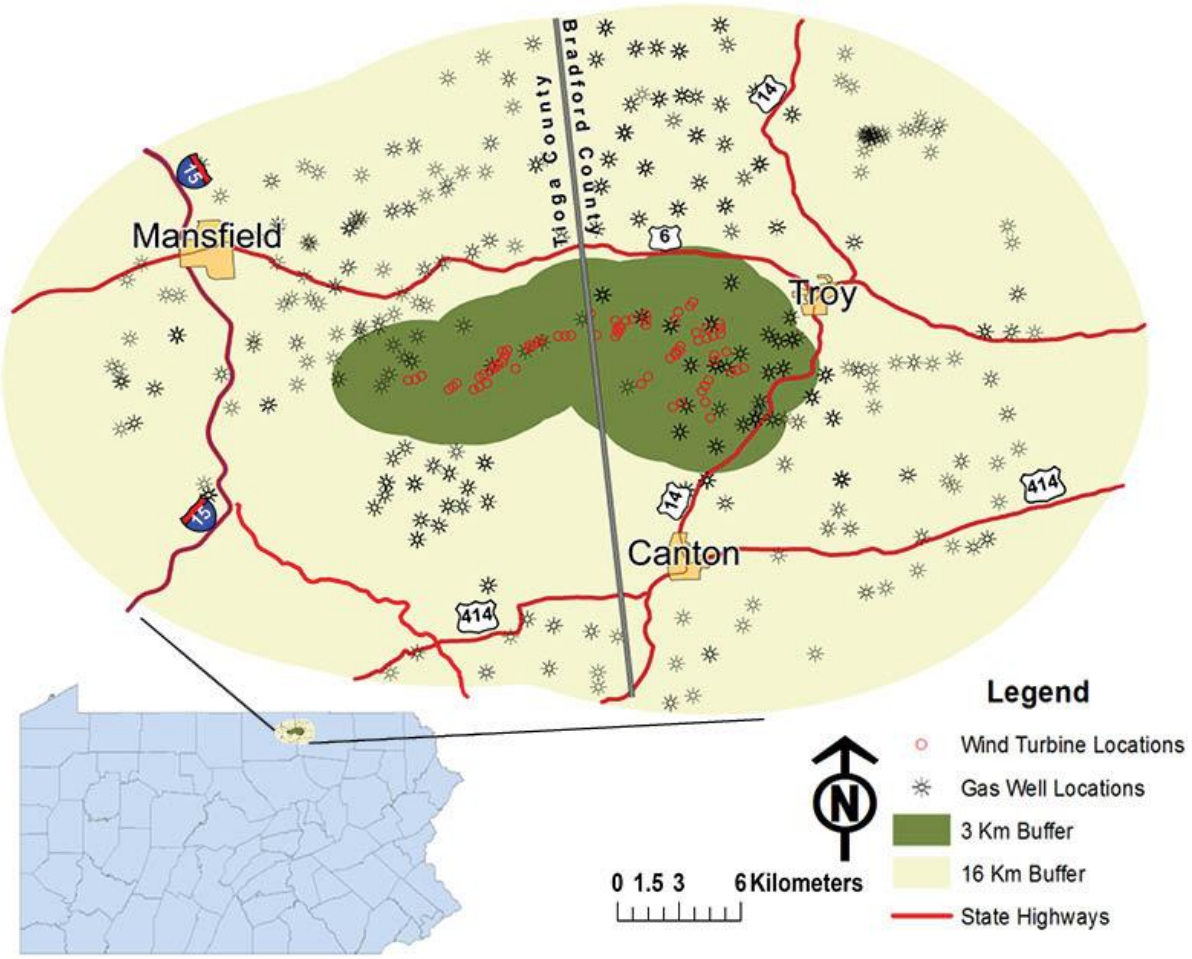

Figure 2-1: Depiction of the survey area. The state of Pennsylvania is shown in inset. Note: In many instances, due to wells drilled in close proximity, Gas Well Location symbols closely overlap each other.

Marcellus Shale Gas Development

The area is also the site of intensive natural gas drilling activity by several national and international energy firms targeting the unconventional Marcellus Shale gas formation. This region of northern Pennsylvania has emerged as a geologically attractive hotspot for development of the Marcellus Shale, with 934 shale gas wells drilled between January 2009 and September 2011 within the 16km region of the Armenia Mountain wind farm area. Of these, 96 were drilled on or adjacent to private parcels that also contain wind turbines (PA DEP 2011).

Comparative and Cumulative Effects

By late 2010, construction of the wind farm's first phase had ended, while gas drilling has continued unabated. While both energy projects produced increased traffic, an influx of workers, and other industrial activity, is clear that the total scope of gas drilling activity has dwarfed that of the wind farm construction. For example, the database of articles for local daily paper, The Towanda *Daily Review*, reports 75 articles containing the words "wind farm" or "turbine" were published from Jan. 1st, 2006 to Sept 1st, 2011. Meanwhile, the paper ran over 250 articles containing the words "gas drilling" or "Marcellus Shale" during a one-year period ending April 30th, 2011 alone. Several of the articles note a cumulative impact from both gas and wind on the area, in the form of increased traffic accidents, roadway wear-and-tear, and increased housing prices from the influx of workers for both projects. While it is still too soon for definitive socio-demographic data to emerge, it is clear from newspaper accounts and other anecdotal data that towns in this area are experiencing at least some of the characteristics documented by sociologists in other areas experiencing rapid natural gas development, including rapid population growth, increased industrial traffic and activity, increasing costs of living, as well as increased employment opportunities, and increased income for landowners who have development on their land.

2-4.2 Questionnaire

A questionnaire was developed to measure resident attitudes towards wind and natural gas development occurring in the Armenia Mountain Area. The questionnaire, entitled "A Survey of Northern Pennsylvania Landowners: Your views on Wind and Natural Gas Development" contained an introductory section that described the purpose of the survey, the sampling method, an assurance of anonymity, and a map of the survey area. This was followed by a section measuring socio-demographic data, an abbreviated 8-item scale of the New Ecological Paradigm (Dunlap et al., 2000), and questions regarding attitudes towards the use of various energy sources. A section containing a battery of questions on the Armenia Mountain Wind farm was then presented, followed by a section with a nearly identical battery of questions regarding natural gas development. Respondents were asked if they received lease or royalty compensation from wind or gas firms, questions on their expectations of the wind or gas developments before they were constructed, if those expectations were met once the projects were completed, and if the developments have made the community better or worse off than it was five years ago. Several questions were also asked to gauge respondent's attitudes toward the future development of gas and wind, including whether they believe additional development will make the area better or worse off.

2-4.3 Survey sample

Publically available property tax databases and ArcGIS software were used to obtain geo-spatial information, usage characteristics, and landowner mailing information for all parcels within a 16km region around the Armenia Mountain Wind farm in Tioga and Bradford counties. All commercial, industrial, and publically-owned parcels were removed from the sample. After duplicate landowner names and mailing addresses were removed, a total population of approximately 8,000 property owners owning parcels classified as residential, agricultural, and

recreational were identified, of which a survey sample of 1,800 property owners was selected. Natural gas drilling activity is relatively evenly distributed across the survey area, while wind farm activity was limited to an area with a relatively low population. To avoid a low response among landowners near the wind farm, all 570 landowners who owned property within approximately 3km of a wind turbine were selected as part of the survey sample, while an additional 1,230 property owners were randomly selected from the remaining landowners within the larger 16km region. Latitude and longitude coordinates were obtained for all wind turbines and gas wells, and resident distance or proximity was measured from these well and turbine coordinates to the geographical center of the land parcel.

Surveys were mailed in April and May of 2011, employing multiple mailings of the survey and reminder letters (Dillman, 1978). Forty-nine of the 1,800 surveys were reported as undeliverable; of the remaining 1,751 surveys, 1,028 were returned, achieving a response rate of 58.7%. Those within 3km of the wind farm had a higher response rate (63.0%) compared to those beyond (54.4%). The survey results as a whole have been weighted to adjust for the oversampling of respondents close to the wind farm (except in cases where the close proximity group is analyzed specifically).

2-4.3.1 Sample representativeness

Using property tax databases to generate a survey sample was advantageous as it provided detailed land use characteristics, accurate name and mailing address information, and precise geospatial information that can be analyzed with geographic information system software. However property tax databases can limit the representativeness of the survey sample in several ways, the most obvious of which is that only property owners are reached. The 2010 Census showed that approximately 25.7% of residences in the survey area were renter-occupied, and these residents were not included in the survey sample. It should be clear

that this survey concerns only land owners, and it is possible that non-landowners would report different views.

Additionally, the majority of names in the property tax database were male, even though the 2010 Census reports that 52% of residents in the survey area were female (U.S. Census Bureau, 2011). Perhaps 75% of the property owner names in the database were listed with either solely a male name or with a male name listed as the primary addressee. The responses to the survey reflect this disparity, with 69.0% (709) of respondents selecting their gender as Male, 27.7% (285) Female, and 3.3% (34) with no gender selected. Unfortunately, such gender disparity is common in survey research, especially in rural areas (Jacobson et al., 2007). However, as is discussed below in the findings, gender did not appear to be a significant factor affecting the survey results.

The median age of the survey respondents was 52 years old, while the census reported that the average age of people aged older than 18 in the survey area was 58 (U.S. Census Bureau, 2011). Survey respondents were more likely to have a college degree than the survey area population. The U.S. Census Bureau reports that 13.2% of the population has some high school education, 33.7% has a high school diploma, 44.8% has some college education, and 8.2% has a Bachelor's degree or higher (U.S. Census Bureau, 2011). The survey respondents reported 5.2%, 32.0%, 30.3%, and 32.4%, respectively. As is discussed below in the findings, education level did appear to influence some aspects of resident attitudes towards the energy development.

2-5 Findings

Overall, landowner attitudes towards natural gas drilling tended to be negative, while attitudes towards wind farm development were much more mixed. Respondents indicated that they were equally positive towards both energy sources before the developments began,

however their attitudes towards natural gas drilling became more negative once development occurred, while attitudes towards the wind farm became somewhat more positive (*Tables 2-1, 2-2*). Respondents also indicated overall that the local wind farm development made their attitude towards the use of wind energy in general more positive, while local natural gas development made their attitude towards the use of natural gas energy in general more negative (*Table 2-1*).

In general, large portions of the respondents marked "neither positive nor negative" for attitudinal questions related to wind farm development, while respondents were more polarized with respect to natural gas drilling (Table 2-1). In response to the question "Would you say the construction of the wind farm has made the study area better or worse off than it was 5 years ago?", 42.3% responded "Neither worse nor better off" (*Table 2-1*). For the same question for natural gas development ,over 30% of respondents indicated "much worse off", over 20% indicated "better off", and only 18.1% marked "Neither worse nor better off" (*Table 2-1*) .

To gauge attitudes towards additional development, respondents were separately asked "…would you say that the study area will be better off or worse off in five years?" for both a scenario of an additional 60 wind turbines constructed on Armenia Mountain, and 5 years of continued natural gas development at current levels.. In both cases, the responses were similar to attitudes on the existing development, although in the case of the wind farm, attitudes towards future development were more negative then attitudes towards the existing facility, with responses to the "neither" category dropping from 42.3% for the existing development to 36.4% for future development, and "much worse off" increasing from 14.5% for the existing development to 19.4% for future development *(Table 2-1).*

Table 2-2 displays how respondents' initial attitudes toward the development compares with how their attitudes changed over time. For both wind and gas development those with initially negative views were likely to become yet more negative over time, and those with

positive views were likely to become yet more positive over time. For example, 68% of those who reported having a "very negative" attitude towards the wind farm before construction consequently reported their attitude becoming "much more negative" after development began. Meanwhile, 84% of respondents with "very negative" views before natural gas drilling occurred shared similar views after development began.

Questions measuring respondent attitudes towards the energy development were combined to form an attitude scale for both the wind farm and natural gas development suitable to perform multivariate statistical analysis (*Table 2-3*). The scales achieved a high degree of reliability in terms of a Cronbach's Alpha of .917 for the wind farm and .939 for gas development, and removing any of the items weakened the scales.

2-5.1 Proximity

GIS software was utilized to obtain a proximity measurement (in km) from the center of the respondent's property to the nearest wind turbine and the nearest natural gas well (*Table 2-4*). Correlations between the wind turbine proximity measurement and attitudes towards the wind farm suggests a weak but statistically significant positive relationship (r_s=.122, p<.01) (demonstrating that landowner attitudes become slightly more positive the further away the property is located)[1] (*Table 2-6*). If respondents with wind farm leases are removed from the sample, the correlation strengthens slightly (r_s= .159, p< .01). Among only landowners very close to the wind farm (< 3 km), no significant relationship with proximity was found. Utilizing a bar graph to depict resident attitudes grouped by proximity shows a clearer relationship (*Fig. 2-2).* Correlations between attitudes towards natural gas development and proximity to a natural

[1] Squaring the correlation coefficient (rs) provides an estimate of how much of one variable's variation can be predicted from (but is not necessarily caused by) knowing the other variable. Interpreting the strength of correlation coefficients (which range, positively or negatively, from 0.0 to 1.0) in social science research is unsettled, although Cohen (1988) suggests coefficients greater than .50 are generally large or strong in terms of magnitude, while those between .50 and .30 are moderate, and those between .3 and .10 are relatively small or weak. However, Hemphill (2003) found that 89% of coefficients reported in journal articles fall below Cohen's benchmark of .50.

gas well also showed no significant relationship *(Table 2-6),* possibly because natural gas wells were relatively evenly dispersed throughout the survey area.

	Very Negative	Negative	Neither Negative nor Positive	Positive	Very Positive
What was your attitude towards construction of the wind farm before it occurred? (Q1)	11.0% 123	7.4% 82	34.4% 383	20.5% 228	26.6% 296
What was your attitude towards natural gas development before it occurred? (Q1)	12.1% 140	7.2% 83	35.8% 414	23.2% 268	21.8% 251
	Much More Negative	More Negative	Neither More Negative nor More Positive	More Positive	Much More Positive
How has your attitude towards construction of the wind farm changed since it has occurred? (Q2)	14.7% 166	12.1% 136	34.2% 386	19.7% 222	19.3% 217
How has your attitude towards natural gas development changed since it has occurred? (Q2)	29.7% 346	17.0% 197	23.6% 274	17.2% 200	12.5% 146
Has the construction of the wind farm made your attitude towards wind energy in general more positive or negative? (Q3)	13.5% 151	10.1% 114	31.0% 348	21.6% 242	23.9% 268
Has natural gas development made your attitude towards natural gas energy in general more positive or negative? (Q3)	24.7% 261	16.0% 186	26.7% 309	18.6% 215	16.2% 188
	Much Worse off	Worse Off	Neither Worse nor Better Off	Better Off	Much Better Off
Would you say the construction of the wind farm has made the study area better or worse off than it was 5 years ago? (Q4)	14.5% 161	12.5% 140	42.3% 471	19.3% 216	11.4% 127
If 60 additional wind turbines were constructed in the study area, would you say that the study area will be better off or worse off in five years compared to how it is now? (Q4)	19.4% 217	13.0% 146	36.4% 408	18.3% 205	12.9% 144
Would you say natural gas drilling has made the study area better or worse off than it was 5 years ago? (Q5)	30.2% 349	14.0% 162	18.1% 209	21.5% 248	16.2% 187
If current levels of natural gas development were to continue for another 5 years, would you say that the study area will be better off or worse off in five years compared to how it is now? (Q5)	30.5% 353	14.7% 170	17.7% 205	20.3% 234	16.7% 193

Table 2-1: Valid percentages and number of responses to measures of attitudes towards energy development.

Attitude towards wind farm before development occurred	How attitude towards wind farm changed during development: Much more negative	More Negative	Neither	More Positive	Much More positive
Very negative	68.0% 83	12.8% 16	11.8% 14	1.7% 2	5.8% 7
Negative	15.8% 13	37.6% 31	30.5% 25	13.6% 11	2.5% 2
Neither negative nor positive	10.5% 40	12.4% 47	55.7% 213	16.6% 64	4.8% 19
Positive	7.5% 17	10.9% 25	29.2% 67	40.8% 93	11.6% 26
Very Positive	3.7% 11	5.3% 16	19.3% 57	17.2% 51	54.6% 162

Attitude towards natural gas drilling before development occurred	How attitude towards natural gas drilling changed during development: Much more negative	More Negative	Neither	More Positive	Much More positive
Very negative	84.8% 119	4.8% 7	4.8% 7	2.1% 3	3.2% 4
Negative	40.8% 34	35.5% 29	14.2% 12	7.8% 6	1.8% 1
Neither negative nor positive	30.0% 124	21.2% 88	33.5% 139	10.8% 45	4.5% 19
Positive	15.3% 41	20.7% 55	27.5% 74	32.6% 87	4.0% 11
Very Positive	10.1% 25	6.9% 17	16.5% 41	23.2% 58	43.4% 109

Table 2-2: Changes in respondent attitude during development.

Scales of Resident Attitude Towards Energy Development

	Mean		Std. Dev.		Cronbach's Alpha	
	Wind Farm	Gas Drilling	Wind Farm	Gas Drilling	Wind Farm	Gas Drilling
Attitude Scale	3.10	2.77	1.123	1.327	.917	.939
Attitude Towards Existing Development	3.01	2.78	1.161	1.384		
Attitude Towards Additional Development	2.93	2.79	1.262	1.431		
Effect on View of Wind Energy in General	3.33	2.89	1.306	1.480		
How Attitudes To Development Changed	3.17	2.66	1.285	1.471		

Possible Answers: 1 = Very Negative; 2 = Negative; 3 = Neither Negative nor Positive; 4 = Positive; 5 = Very Positive

Table 2-3: Attitude Scales

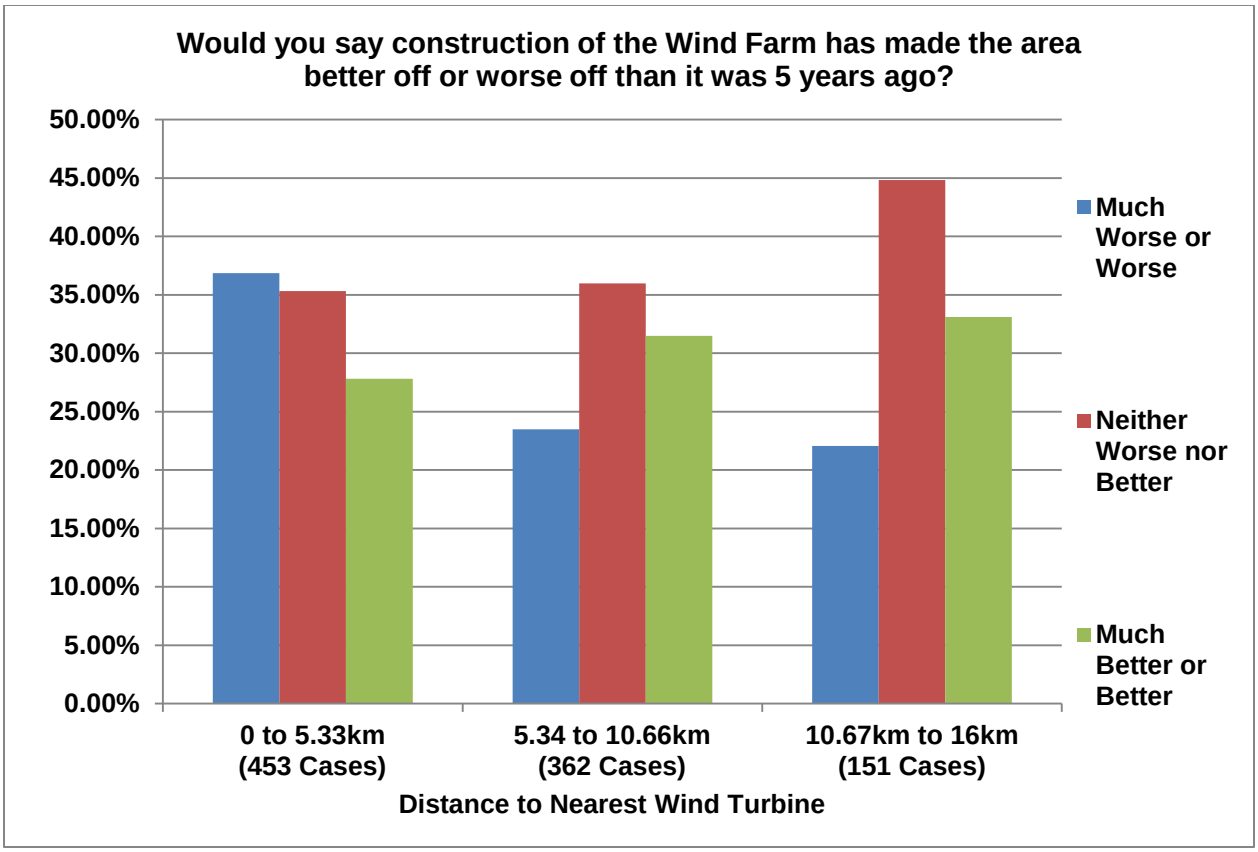

Fig. 2-2: Attitudes toward the existing wind farm development, grouped by proximity.

2-5.2 Economic Compensation and Attitudes

Landowners were grouped into three groups: (1) those with no lease or gas drilling development on their property, (2) those with a lease only, and (3) those with a lease and development (*Table 4*). Dummy variables for these groups were assigned, and bivariate regression analysis shows landowners who have natural gas leases (r_s = .171, p<.01) or gas development (r_s = .188, p<.01) on their property are more likely to express that natural gas drilling made the area better off than those who do not have leases or development (*Table 2-6*). In other words, respondents with leasing or development are more likely to view natural gas drilling favorably, and those without leasing or development are more likely to view natural gas drilling negatively *(Fig. 2-3)*.

Attitudes toward the wind farm are not as related to leasing or development experience: the correlations are weaker and are not statistically significant (likely due in part to the small number of wind energy landowners) *(Fig. 2-4).*

A respondent's experience of employment within the gas industry was also strongly correlated with positive attitudes toward current gas development (r_s = .133, p<.01); while employment by friends and relatives showed weaker correlations with positive attitudes development (r_s = .085, p<.01) (*Table 2-6*). Correlations between attitudes of the wind farm and wind industry employment were very weak and statistically insignificant.

2-5.3 Environmental Attitudes

The 8-Item NEP scale was highly reliable (Cronbach's Alpha = .840) (*Table 2-5*). The resulting summed scale was strongly negatively correlated with attitudes towards natural gas development (r_s = - .527, p<.01 for both existing and future development), suggesting that respondents with a high degree of concern for environmental issues are much more likely to oppose natural gas drilling (*Table 2-6*). Respondents showed a similar, weaker, relationship with existing and future wind farm development (r_s = - .139, p<.01 and r_s = -137, p<.01), showing that respondents with higher concern for environmental issues as measured by the scale were also more likely to have negative attitudes towards the wind farm development (*Table 2-6*).

	Mean	Min	Max	St. Dev.
Average distance to nearest wellhead (km)	1.6	0.07	4.6	0.82
Average distance to nearest wind turbine (km)	7.3	0.03	4.7	3.8
Gender (1 = Male; 2= Female)	1.3	1	2	0.45
Age (yrs.)	51.7	13	87	13.5
Education 1 = Some H.S; 2= H.S. Deg. ; 3 = Some College ; 4 = College Deg. 5= Post-College	3.08	1	5	1.18
Property size (acres)	37.7	0	1200	101.3

	Landowner Status with Industry				Prior or Current Employment By Self			Prior or Current Employment Friends/Relatives		
	No Lease or Development	Lease Only	Lease and Develop-ment	Missing	Yes	No	Missing	Yes	No	Missing
Natural Gas Industry	358	515	90	65	54	882	92	347	589	92
Wind Farm Industry	939	27	21	41	10	931	92	50	886	92

Table 2-4: Summary Statistics, including leasing, development, and employment status among survey respondents.

2-5.4 Age, Gender, and Education

Females were somewhat more likely to have a negative attitude towards existing natural gas drilling (r_s = -.130, p<.01), but there was no significant relationship between gender and attitudes towards the wind farm (*Table 2-6*). Females were also more likely score higher on the environmental attitudes scale (r_s = .134, p<.01) Education and age both had negative relationships with both gas drilling (r_s = -.156, p<.01 and -.237, p<.01, respectively), and the wind farm (r_s = -.096, p<.01 and -.083, p<.05, respectively), indicating that more educated and younger respondents tended to be more negative about each form of energy development

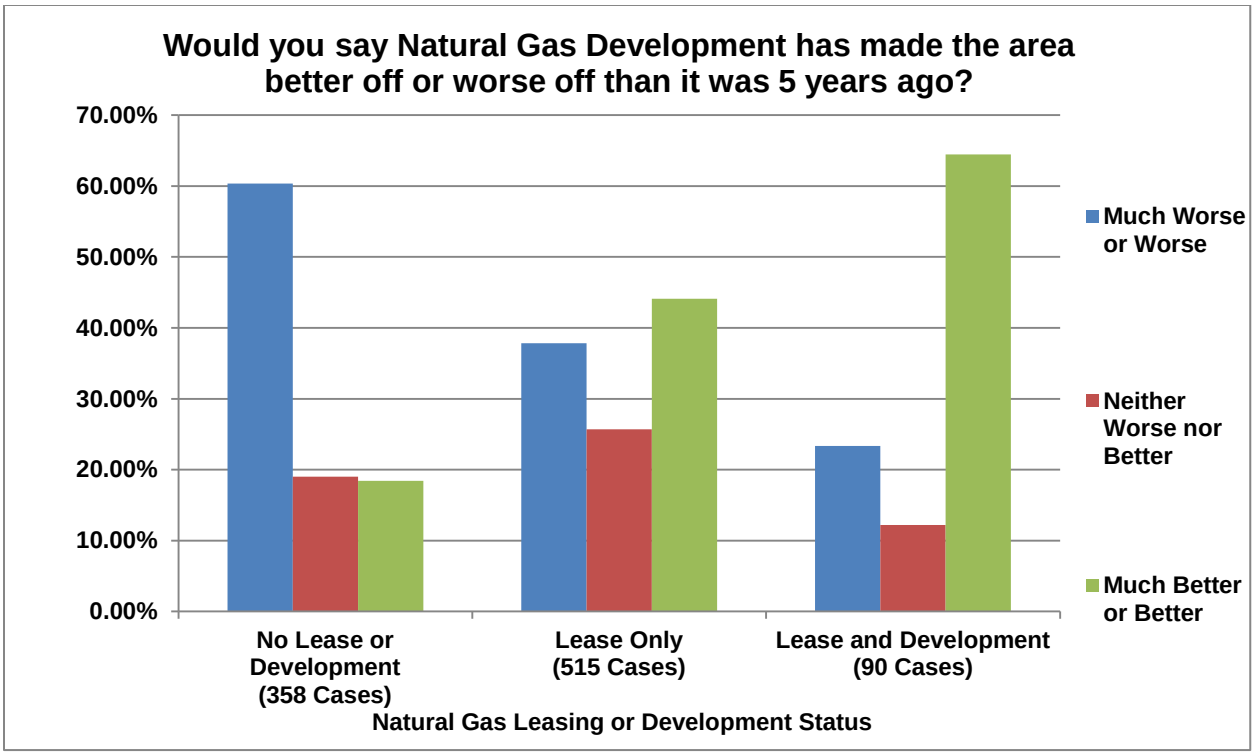

Fig. 2-3: Attitudes towards natural gas development by landowner lease or development experience

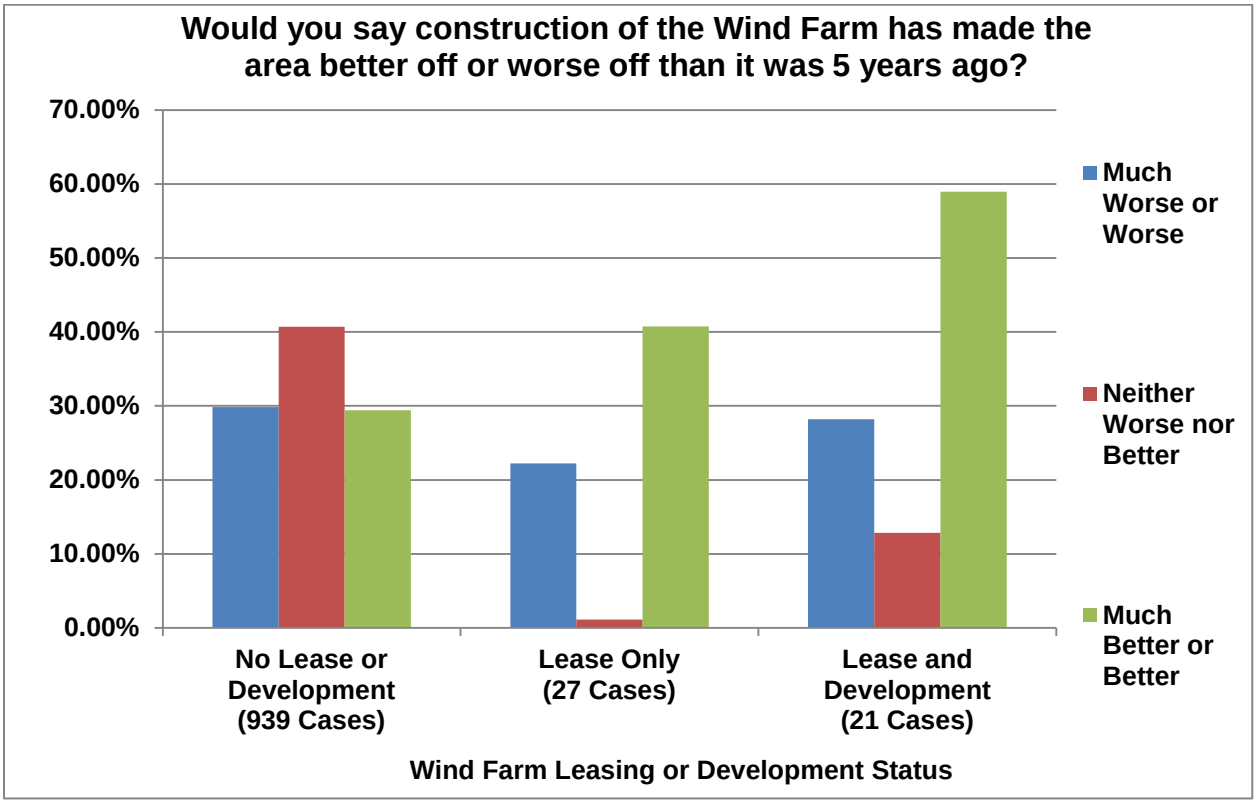

Fig. 2-4: Attitudes towards the wind farm by landowner lease or development experience

2-5.5 Attitudes towards both Gas and Wind

Attitudes toward gas drilling and the wind farm show moderate-to-strong positives correlation (i.e. r_s = .346, p<.01 for attitudes toward existing development) (*Table 2-6)*. Respondents who view gas drilling positively are also more likely to view the wind farm development positively, and vice-versa.

2-5.6 Multiple Regression Analysis: Gas and Wind Development Attitudes

Multiple regression analysis shows that when a number of independent variables are taken together, including leasing and employment experience, environmental attitudes, and demographic factors, they can explain a fair amount of variation in resident attitudes towards natural gas development (*Adj. R^2 = .424*) (*Table 2-7).* The analysis shows that even when considered together, environmental attitudes remains the largest driver of the natural gas development attitude scale (beta = -.471, p<.01), while leasing (beta = .188, p<.01), development (beta = .188, p<.01), and employment experience (beta = .125, p<.01) also all still appear to positively influence attitudes to some degree. However, factors such as gender, age, and education show a negligible effect in the multiple regression analysis, suggesting that the explanatory power of these variables in the bivariate analysis is more likely related to their colinearity with other variables such as leasing status or environmental attitudes.

Conversely, multiple regression analysis is not successful in explaining variation in attitudes towards the wind farm (*Adj. R^2 = .032*) (*Table 2-8*). Environmental attitudes remained a predictor of wind farm attitudes (beta = -.137, p<.01), while age, gender, and proximity displayed much weaker (although statistically significant) influence on wind farm attitudes.

	Attitude Towards Natural Gas Development			Attitude Towards Wind Farm Development			Environmental Attitudes
	Existing[a]	Additional[a]	Scale[a]	Existing[a]	Additional[a]	Scale[b]	Scale[b]
Environmental Attitudes Scale	*-.518***	*-.528***	-.583**	*-.161***	*-.159***	*-.087***	
Wind Farm Leasing (Dummy)	*.083***	*.056*	*.056*	*.043*	*.004*	*.006*	*-.036*
Wind Farm Turbine (Dummy)	*.087***	*.103***	*.086***	*.030*	*-.002*	*-.017*	*-.061**
Natural Gas Leasing (Dummy)	*.171***	*.174***	*.159***	*.059*	*.026*	*.029*	*-.113***
Natural Gas Well (Dummy)	*.188***	*.185***	*.196***	*-.012*	*.000*	*-.049*	*-.081***
Distance to Wind Turbine	*-.023*	*-.055*	*-.034*	*.122***	*.149***	*.088**	*.032*
Distance to Gas Well	*-.062**	*-.073**	*-.043*	*.034*	*.030*	*-.004*	*-.035*
Employment in Wind Industry (Friends/Relatives)	*.037*	*.044*	*.027*	*.052*	*.051*	*.045*	*-.029*
Employment in Wind Industry (Self)	*.042*	*.037*	*.022*	*.008*	*.025*	*-.002*	*-.034*
Employment in Gas Industry (Friends/Relatives)	*.085***	*.081***	*.048*	*.086**	*.119***	*.107***	*-.017*
Employment In Gas Industry (Self)	*.133***	*.131***	*.154***	*-.003*	*.020*	*-.013*	*-.059*
Gender (1 = male; 2= female)	*-.130***	*-.115***	*-.179***	*.054*	*.044*	*.058*	*.134***
Age	*-.117***	*-.154***	*-.130***	*-.109***	*-.096***	*-.093***	*.020*
Level of Education	*-.123***	*-.136***	*-.147***	*-.060*	*-.080**	*-.089**	*.079**
Attitude Towards N. Gas Development Before Const.	*.515***	*.512***	--	*.228***	*.248***	*.215***	*-.420***
How N. Gas Attitude Changed Since Development	*.776***	*.786***	--	*.301***	*.318***	*.263***	*-.566***
Attitude Towards Existing N. Gas Development	--	*.886***	--	*.346***	*.335***	*.284***	*-.518***
Attitude Towards Additional N. Gas Development	*.886***	--	--	*.340***	*.350***	*.289***	*-.528***
Natural Gas Attitudes Scale	--	--	--	*.346***	*.354***	*.295***	*-.583***
Attitude Towards Wind Development Before Const.	*.166***	*.172***	*.196***	*.534***	*.518***	--	*-.078**
How Wind Attitude Changed Since Development	*.171***	*.177***	*.182***	*.698***	*.687***	--	*-.074**
Attitude Towards Existing Wind Development	*.346***	*.340***	*.346***	--	*.842***	--	*-.161***
Attitude Towards Additional Wind Development	*.335***	*.350***	*.351***	*.842***	--	--	*-.159***
Wind Farm Attitudes Scale	*.284***	*.289***	*.295***	--	--	--	*-.087***

a: Spearmans' rho correlation coefficients. *Significance (2-tailed): * p < .05; **p < .01*

b: Pearson's coefficients

Table 2-6: Parametric and Non-parametric correlation coefficients among selected variables and attitudes toward existing and additional wind and gas development.

Multiple Regression Analysis of Variables Explaining Attitude Scale Towards Existing Natural Gas Development

Independent Variables	B	Std. Error	Beta
(Constant)	*25.673*	.288	
Gas Lease (dummy)	*1.978*	.282	.188**
Gas Well (dummy)	3.554	.503	.188**
Distance to Well	*-.008*	*.257*	*-.001*
Environmental Attitudes	*-.459*	*.022*	*-.520***
Gas Industry Employment (self)	*2.658*	*.538*	*.125***
Gas Industry Employment (friends and relatives)	*.045*	*.143*	*.008*
Gender (1= male; 2=female)	*-.682*	*.282*	*-.059**
Education	*-.316*	*.010*	*-.071***
Age	*-.038*	*.111*	*-.096***

R = .655; R Squared = .429; Adjusted R Squared = .424
Significance (2-tailed): * p < .05; **p < .01;

Table 2-7: Multiple Regression Analysis of Natural Gas Development Attitudes Scale

Multiple Regression Analysis of Variables Explaining Attitude Scale Towards Existing Wind Farm Development

Independent Variables	B	Std. Error	Beta
(Constant)	*3.824*	.257	
Wind Lease (dummy)	*.220*	.279	.026
Wind Turbine (dummy)	.159	.311	.017
Distance to Turbine	*.041*	*.016*	*.083**
Environmental Attitudes	*-.214*	*.050*	*-.137***
Wind Industry Employment (self)	*-.232*	*.325*	*-.024*
Wind Industry Employment (friends and relatives)	*.114*	*.094*	*.040*
Gender (1=female)	*.179*	*.082*	*.070**
Education	*-.059*	*.032*	*-.059*
Age	*-.007*	*.003*	*-.080**

R = .202 ; R Squared = .041; Adjusted R Squared = .032
Significance (2-tailed): * p < .05; **p < .01;

Table 2-8: Multiple Regression Analysis of Natural Gas Development Attitudes Scale

2-6 Discussion

2-6.1 Summary

The findings of this study show local landowners as generally positive (and in many cases, neutral) towards local wind farm development. This largely corresponds to existing literature (Devine-Wright, 2005), although the findings here do show a sizeable minority (30%) who view the wind farm as making the area worse or much worse off. These findings also support wind farm research that has shown residents are generally positive before development and that they show generally positive attitudes after it is constructed (Braunholtz, 2003). Proximity, age, and education seemed to play small roles in influencing attitudes towards the wind farm. More interestingly, given the "green" image of wind farm development, it is notable that environmental attitudes showed the largest (negative) effect.

The natural gas findings largely mirror results from other energy impacted communities that found attitudes towards energy development tend to be more negative during periods of intensive development, such as that currently being experienced in the Armenia Mountain region (Thompson and Blevins, 1983; Brasier et. al., 2011a; Murdock and Leistritz, 1979; Anderson and Theodori, 2009). Landowner compensation or experience with an energy company appears to be a much larger influence than proximity on resident attitudes, especially in the case of natural gas development. Such industry experience – either in the form of leases, development on the property, or employment – is a strong predictor of positive attitudes towards current and future development, largely supporting the "conventional wisdom" that has in many ways dominated the debate over natural gas development (Jacquet and Stedman, 2011).

2-6.2 Challenging NIMBY

The survey results suggest that resident proximity to the development (i.e. the NIMBY hypothesis) appears to play only a small role in explaining resident attitudes toward either the wind farm or plans for additional wind farm development, and little-to-no role in explaining attitudes toward natural gas drilling. These results regarding the wind farm support the results of some other researchers on the topic (Swoffard and Slatterly. 2010; Johansson and Laike, 2007) while not supporting the "reverse NIMBY" phenomenon observed by others (Warren et al. 2005; Braunholtz, 2003). As discussed by Swoffard and Slatterly (2010), given the definitional and theoretical haziness of the NIMBY concept, it is unclear at what spatial distance one should measure NIMBYism. As noted previously, gas drilling is relatively pervasive and evenly distributed in the area, and an expanded analysis with property owners who were further away from gas drilling activity may achieve different results. Yet, it should be noted Michaud et al. (2010) measured NIMBY on the continent-level scale in the context of off-shore oil drilling and still found results similar to this study.

2-6.3 Comparing Attitudes towards Wind and Gas

The survey findings dispel any notion that, at least in Northern Pennsylvania, the perceptions of natural gas drilling and wind farm development are somehow diametrically opposed, and instead suggest that a sizeable portion of landowners view wind and natural gas – and perhaps larger issues of local land use development and technological change – in a similar light. While attitudes towards wind development were more positive with development and attitudes towards gas development more negative, overall persons with positive attitudes towards natural gas development were more likely to have positive attitudes towards the wind farm (and vice versa). It is clear that in this survey area that the most environmentally

concerned individuals tend to view both wind and gas development negatively, and that environmental attitudes were the strongest predictors of attitudes towards both wind and gas.

2-6.4 Implications for Energy Planning and Development

The data from this survey confirms that sizable minorities of local residents remain opposed to local energy development, especially natural gas drilling. Those most opposed are much more likely to express environmental concern, to not have leased their land to an energy developer or experienced development on their property, and have not had employment experience in the industry.

Perhaps the most obvious rationale for this relationship is that people with these experiences with industry will presumably perceive a financial gain from their experience and thus view the development as more positive for the area overall, while residents without leases or employment will perceive no benefit to themselves while experiencing negative impacts in the form of increased traffic, environmental risk, etc. Even in the absence of negative impacts such as traffic and environmental risk, social comparison theory suggests that people primarily judge their state of well-being by comparing it to the perceived well-being of others (Festinger, 1954). If non-leasing landowners in the Armenia Mountain area have perceived their neighbors to be better off due to natural gas drilling, they may perceive their own well-being to have decreased, even if no substantial changes to their own well-being have occurred. Additionally, persons who experience discussions with energy representatives and observe first-hand the effects the drilling process will have a different set of experiential data, as well as exposure to industry-based perspectives and representations, upon which to assess the impact of the development on their communities (van der Horst 2007).

While it is easy to target economic compensation as the reason why some residents are more likely to support development, alternative rationales can also be formulated. The

questionnaire did not directly ask respondents how economic compensation has influenced their attitudes toward the development, yet it did ask respondents to self-report their attitudes as they existed before development occurred, and the results of these questions show that respondents who view the development positively were also likely to have viewed the development positively before it occurred. It may be the case that property owners who have negative attitudes towards energy development will be less likely to lease their land or gain employment in the first place, while property owners with positive attitudes will be among the first to lease their properties or seek employment. Persons who agree to lease their property for energy development may hold a different fundamental view on the role of the environment in energy production.

It is likely that the factors of compensation, experience, and environmental attitudes all contribute in some way to explain why persons with leasing, development or employment are more likely to support natural gas energy. Environmental concern can perhaps best be addressed by accentuating environmental benefits accrued globally, and by managing the amount of environmental and health risk that local residents perceive. If it is the direct experience and communication with industry officials that is causing some residents to perceive more positive impacts from development, then clearly energy companies must do a better job of reaching out to residents without this experience or communication. However, if it is believed that economic compensation is the main driver of positive attitudes towards development, then increasing the amount of compensation to non-leasing residents of the community is perhaps the best way to overcome opposition. Such compensation – often in the form of royalties paid to local governments, school districts, and organizations – is commonplace in other areas of the US and the world.

2-6.5 Limitations

In many ways the results of this research uncovers more questions than it answers, and provides many avenues for additional inquiry. While this research shows that there is a relationship between positive attitudes and leasing experience, for example, it does not explain why the relationship exits. A more targeted study of lease holders that identifies the levels of compensation received , along with factors such as the motivation for leasing, would better explain the relationship between leasing and attitudes.

The results of this survey are limited in several ways, perhaps the largest of which is that non-landowners are not included in the survey sample. It is possible that the attitudes of non-landowners (which represent 25% of the total population) may differ in a systematic fashion, especially as none of them would have leases with wind or natural gas firms. However, the respondents were also more highly educated than the population at large, and the results show that respondents with a lower education level would indicate more positive attitudes towards both developments.

Furthermore, it is likely that these attitudes will change over time (Wolsink, 2007); this survey measures attitudes to newly constructed or ongoing energy projects, and previous research in energy impacted communities has shown that attitudes among different stakeholders may change as the developments become a fixture of the community.

While studying resident attitudes in an area experiencing multiple forms of energy development offers unique research opportunities, it can also provide challenges to effective measurement. It is clear that natural gas development in the area has been far more intensive than activity related to the wind farm and the intensive level of natural gas development may have overwhelmed the perception of local impacts from the wind farm construction. A large portion of the respondents indicated a neither positive nor negative view of the wind farm

development, and it is possible that in the absence of natural gas development, respondents would have reported more extreme positive or negative attitudes towards the wind farm.

Future analysis of this dataset can perhaps answer some of these questions, including a more specific description of the positive and negative impacts residents perceive from the different energy sources. However, new and more targeted research is needed to explore the concepts of direct economic compensation and the extent to which it influences resident perception of large scale developments, as well as a more specific investigation of perceived environmental costs and benefits. .

2-7 Conclusion

A mail survey was conducted in the spring of 2011 of landowners in a north-central region of Pennsylvania that reveals landowner attitudes towards nearby natural gas development and nearby large-scale wind farm construction. The findings show that while landowners hold generally negative views towards local natural gas development, and much more positive views towards local wind farm development, a large segment of the population views both energy developments in a similar fashion. Proximity is found to have little relationship with attitudes toward the developments, while environmental attitudes and leasing and development are highly correlated.

Energy experts predict that many tens or even hundreds of thousands of wind turbines and gas wells will be constructed in the United States in the near future. These industries stand out from other forms of energy development in that they lease the development sites from a multitude of private landowners across landscape scales and provide differing forms of compensation to these landowners. It is clear that a better understanding of resident perceptions of multiple forms of energy development will become critical in the effective planning and siting of these projects, especially in areas that offer a mix of landowners who are

under lease and who not affiliated with the development. This research suggests that reducing the perceived and actual environmental impact of energy development, while increasing the economic impact perceived by all residents in the community will help to gain community support for landowners not affiliated with the energy development.

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CHAPTER 3:

THE RISK OF SOCIAL-PSYCHOLOGICAL DISRUPTION AS AN IMPACT OF ENERGY DEVELOPMENT AND ENVIRONMENTAL CHANGE

Abstract

Researchers have recently argued that disruption to social-psychological values such as attachment and community- and place-based identity may drive oppositional behavior to large land use changes, including energy development. While risk analysis has fixated on impacts to health and property values, this review shows that the risk or threat of social and psychological disruption has been documented as among the most troublesome aspects of large development projects. Further, social actors strive to influence residents' perception of these social-psychological risks and the tools of risk analysis can be used to measure and predict these types of disruptions to community and place-based identities.

"I [live] in the town of Montrose, which is a very wonderful 'Mayberry'-type place. It's a very small, close-knit area, and over the past 5 years this beautiful community that I've known for over 20 years has changed completely. There are, I'd say, a quarter of the population here is from all over the country – all kinds of strange people, unknown to this area."

--- "Hilda", of Susquehanna County, PA, calling into a radio program regarding the effects of Natural Gas drilling in the Marcellus Shale on December 7th, 2011.

3-1Introduction

The planning and siting of large land use developments such as wind farms, mining operations, or waste facilities has long encountered resident opposition. Often, diverse forms of opposition are conjoined under the label NIMBY ("Not In My Back Yard"), a term that describes residents who might otherwise support such projects but oppose them when sited in close proximity (Schively 2007). Since its introduction in the 1980s, the NIMBY term has been panned by academics and researchers as imprecise and pejorative, ultimately too simplistic and dismissive to take into account the complex range of attitudes held by residents confronted by new industrial land uses (Brion, 1988; Freudenbug and Pastor, 1992; Wolsnik, 1994; Warren et al., 2005). Devine-Wright (2009:431) notes that "the NIMBY concept unhelpfully muddles whether opposition should be conceived as a belief or attitude towards a development, a behavioral response taken by individuals or the collective actions of organized groups". Wolsnik and Devilee (2009:219) deride the process of labeling people as NIMBY "without presenting any adequate investigation of the motives of the opponent". Some researchers have suggested that NIMBY-type attitudes or behaviors might best be explained by other factors, including political or environmental attitudes (Michaud et al., 2008; van der Horst, 2007), or perceptions of procedural fairness (McComas et al., 2011; Gross, 2007). Further, it has been pointed out that resident perceptions may change – even dramatically – before, during, and after construction of a project and that the NIMBY concept typically fails to explain such temporal variation (Jenkins-Smith et al., 2009; van der Horst, 2007).

Wester-Herber (2004), Devine-Wright (2009), and Phandke (2011) have argued that the social-psychological concepts of attachment and identity are critical to understanding behavior typically dismissed as NIMBY, and that resident concern over disruptions to closely-held place and community identities can help explain support or opposition to local development projects (see also Stedman, 2003; Devine-Wright and Howes, 2010). This paper will support and

expand these arguments by engaging environmental psychology, rural sociology, and environmental planning literatures that show these types of disruptions to community- and place-based identity have long been identified as central to resident perceptions of large land use projects such as energy development. This paper will posit that it is the risk or threat of these social-psychological disruptions that may be among the things that most trouble local residents when confronted with rapid change; in some cases this perceived risk of disruption may be a main driver of oppositional behavior. This paper will additionally describe how actors in the planning and siting process often strive to influence residents' perception of these social-psychological risks. And finally this paper will show that these types of disruptions to community and place-based identities can be measurable and predictable using the tools of risk analysis that have been successful in measuring perceptions of other risks such as health and economic well-being (Slovic, 1987).

The perception of risks to values beyond health or property is often not considered by researchers or planners (Short Jr., 1984; Wilkinson, 2001; Wester-Herber, 2004), despite ample evidence that land use changes can adversely affect resident identification with and behavior in their communities (Brion, 1988; McEvoy and Dietz, 1987; Murdock and Leistritz, 1979; Stedman, 2004; Edelstein, 1988; Freudenburg, 1982). Furthermore, it has been shown that disruptions to social- and place-based identities can produce powerful feelings of stress, anxiety, and trauma (Goffman,1963; Burke, 1991; Haskell and Randall, 2009). Approaches such as Social Impact Assessment (or SIA) that purport to look directly at the socio-economic impacts of rapid change tend to be limited to the analysis of readily measurable secondary data such as employment and poverty rates, economic impacts, or measures of social pathology such as rates of crime or divorce (Glasson and Heaney, 1993; Chadwick, 2002; Freudenburg, 1986). However, among practitioners of SIA, increasing recognition of subjective impacts of change has increased attention paid to "quality of life" indicators (Freudenburg and Keating,

1982; Dietz, 1987; Burdge, 1994; Freudenburg, 1986). The “ambiguity of harm” (Freudenburg 1997:27) that can characterize technological disasters crucially reinforces the importance of understanding the subjective experience and interpretation of an event, rather than just the more tangible outputs described above.

In the planning process for land use change, it is clear that residents often voice concerns over possible impacts to social-psychological values, especially in closely-knit rural areas, or areas with rich environmental amenities. Residents describe opposition to proposed development with sentiments like "Somewhere in this process we realized ... that the gas industry was a heavy industrial use that is simply incompatible with our lifestyle," (Richmond, 2011:1) or that “[the new workers] may live next door, their children will play with our children, but their heart will not be in Millard County ” (Glass, 1993:28), or simply that “[the community] won't be the same if you take away its soul" (Booth, 2012:1).

Planning and risk analysis depends on quantifiable data, and environmental planners and risk analysis practitioners may have been loath to engage the concept of disruption to place and community identities because and they may view such disruptions as subjective, unquantifiable and unpredictable. In contrast, this paper shows that quantitative measurement of these variables has been ongoing since the early 1970s, and that their measurement is similar to the measurement of other types of risk perception. We therefore suggest that these elements can be measured quantitatively and should be engaged with other types of measurable impacts.

This author believes, as do many, that understanding resident support or opposition to industrial siting and land use change is crucial to the future of energy policy as rising energy prices, technological innovations, population growth, and incentives to reduce carbon dioxide gas emissions hasten the construction of new energy projects across the globe. Many of these

energy developments –such as wind farms and natural gas fields –portend dramatic changes to communities and the residents who live there. Policies to combat the causes of global climate change are predicated on transformations to the energy industry and massive amounts of new development across the world. Proposals in the UK and US to produce 15% of electrical generation from wind power, for example, have been criticized as modest by some, yet will require the construction of many tens of thousands of wind turbines in a few short years, many times more than exist today. These energy projects—if they are to be implemented--must gain acceptance from local residents, yet local opposition is often strong and remains a major factor in the implementation of new energy policies (Evans et al., 2011).

3-1.1 NIMBY and risk analysis

It is clear that NIMBY opposition to land use proposals is related to the concept of risk and can be engaged using risk analysis theory and method (Shivley, 2007). Freudenburg and Pastor (1992) note that oppositional behavior to local land uses stems, in essence, from a quasi-risk assessment performed by the local residents of the land use proposal. Residents may assess the risks as unacceptable and transform these assessments into feelings of threat or dread.

Risk assessment and analysis grew in the early 1980s with probabilistic assessments of health and property risk from various technological endeavors (such as nuclear power plants: c.f. Edelsein, 1988), and quickly broadened to documenting how and why different people perceive different levels of risks from a range of activities. The concept of risk has been described as an outcome of the modernization process (Beck, 1999), whereby individuals are increasingly likely to encounter, and need to reflect upon, the ramifications of new, technologically advanced processes. Freudenburg (1993) describes the science of risk assessment as a function of rationalization, as scientists create objective, rational, and

technocratic measurements to quantify the probabilities of what otherwise would be emotional and value-laden events. A byproduct of such technocratic risk assessments is the public's lack of trust in officials and other "experts", especially when the possible risks involved include catastrophic damage to humans and the environment (Weston, 2004).

Rosa (1998:28) has provided what is one of the most widely-used definitions of risk: "A situation or event in which something of human value (including humans themselves) has been put at stake and where the outcome is uncertain." This definition clearly encompasses risks to things humans find valuable such as social structure, community relations, and the identity of the place where they live. Yet, despite this diversity of perceived risks, the discipline of risk analysis almost exclusively focuses on risks to either human health or economic value[2].

James Short Jr., in a seminal 1984 presidential address to the American Sociological Association entitled "The Social Fabric at Risk : Toward the Social Transformation of Risk Analysis", strongly warned risk analysis practitioners that: 1) analysis of risk must include the social context in which risk is perceived, communicated, and managed; and 2) the range of values that may be considered to be at risk is "too narrow" and needs to expand to include risk to the social fabric, which he defines as lifestyles, communities, institutions, mental health, social values, and quality of life (Short Jr., 1984:711). He called for risk analysis to study how social-psychological values might be harmed by change, as that these types of risks may be seen as equally or more important in the eyes of local residents.

Indeed, in her review of the NIMBY/LULU literature, Shively (2007) outlines several of the risks most common among land-use opponents. Although health risks and risks to property values are at the top of the list, a number of other concerns closely follow: the risk of additional

[2] Take, for example, the first two sentences of the book Risk, Uncertainty, and Rational Action by Jaeger et al. (2001:1): "Automobile and plane crashes, toxic chemical spills and explosions, nuclear accidents, food contamination, genetic manipulation, the spread of AIDS, global climate change, ozone depletion, species extinction, and the persistence of nuclear weapon arsenals: the list goes on…. Risks Abound."

undesirable land uses; the decline in quality of life; the decline in the image of the community; the overburdening of community services; and the aesthetically objectionable quality of the facility.

Since the time of Short Jr.'s address, researchers have made great strides to analyze the social contexts in which risk is perceived: the ways in which the risks are communicated (Kasperson et al., 1988); social and demographic status (Flynn et al., 1994), cultural factors (Douglas and Wildavsky, 1983), personality traits (Ulleberg and Rundmo, 2003), gender (Harris et al., 2001; Davidson and Freudenburg, 1996), perception of economic gain (Groothuis et al., 1998), attribution of fault (Freudenburg, 1997; Sandman, 1989), and perception of fairness in the planning and siting process (McComas et al., 2011; Sjoberg and Drottz-Sjoberg, 2001) have all been shown to influence the perception of and acceptability of risk.

However, Short Jr.'s call for risk analysis to consider factors beyond health or economics to be at risk has largely been forgotten, and it is crucial to re-engage if resident opposition to land use change is to be fully understood.

3-1.2 Social-psychological disruption

Researchers have long explored "the complex ways the self is situated in the social-spatial environment" (Cuba and Hummon, 1993:111). How people base their personal identity in part according to how they view their social relationships, their role in society, and the places in which they live has been widely explored, including by prominent authors such as Freud and Mead and many others (Twigger-Ross et al., 2003; Parsons, 1964; Wenger, 1998; Callero, 1985; Turner, 1978; Proshansky et al., 1983). A person's place and community is important in that "biographical experience with a locale can transform the local landscape into a symbolic extension of the self by imbuing it with the personal meanings of the life experiences" (Hummon, 1992:258) "to the extent that they cannot really express who they are without inevitably taking

into account the setting that surrounds them as well" (Ryden, 1993:76). Cohen (1990:109) reports community "members find their identities as individuals though their occupancy of the community's social space" and Cuba and Hummon (1993:112) note that places and communities have become widely viewed as "important mechanisms through which identity is defined and situated".

Sense of place and sense of community explore how individuals and groups perceive and value their environments (Trentelman, 2009). It is though human experience that "abstract space, lacking significance other than strangeness, becomes concrete place, filled with meaning" (Tuan, 1977:199). As such, the nature of the experience that an individual or group has becomes the raw material for individual interpretation and social construction of meaning. Changes to the physical space (including both social and ecological elements), the mode of encounter with it, and discourse about what kind of place it is—and how it may be affected by such change—are crucial for understanding subjective experience of social change.

Residents imbue meanings or narratives on the social and physical environments in which they live: "farming community", "ski town", "close knit", and "rural area" are a few examples of place or community meanings that comprise both social and physical characteristics. However such meanings may be more complex, such as exuding environmental qualities ("a place with clean air and water"), social cohesion ("a place where everybody knows everybody"), safety ("a place where you don't have to lock your doors at night"), and mental restoration ("a place to get away from it all") are some examples.

Place attachment and community attachment describe how important these identities are to individuals, how "bonded" an individual is to a location, and the degree of uniqueness or irreplaceability individuals see in these place and community traits. Giuliani (2003:150)

describes place attachment as a “multidimensional” concept, but ultimately (2003:146) “a fundamental human need” for people to be bonded emotionally to certain locals.

Important distinctions between the concepts of place and community can be made, especially regarding the inclusion or exclusion of bio-physical and socio-cultural attributes (for example, see Stedman et al., 2006). However, as this paper will show, large land use changes have the potential to disrupt both place and community, and that resident reactions to these disruptions can be similar. In this work, the concepts are treated largely the same vein. It is agreed (along with Stedman et al. (2004) and Williams and Patterson (2007)) that, especially in context of disruption to closely held place meanings, categorizing those place meanings along purely physical or cultural lines largely “misses the point” that it is “not a place’s intrinsic attributes (biophysical, social, or otherwise) that make it special and meaningful, but that over time it has become a symbol for a particular constellation of meanings and relationships” (Williams and Patterson, 2007: 937).

3-1.3 Identity disruption

The idea that disruption to an individual’s self-identity may represent a significant source of stress, anxiety, and psychological harm has received extensive treatment (Goffman, 1963; Burke, 1991; Erkson, 1994). More recently, some researchers have recognized that the disruption of place-based identities can also have profound and traumatic effects on some residents, particularly if they see these identities as informing or constituting a large portion of their personalities and individualities (Possick, 2006; Milligan, 2003; Brown and Perkins, 1992). Place identity disruption has been most commonly studied in instances of forced migration or displacement (Fried, 1963; Fried, 2000; Milligan, 2003; Burge and Ludtke, 1972). Brown and Perkins (1992) and Inhalan and Finch (2004) document the existence of pre-disruption, disruption, and post-disruption phases associated with the phases of migration and change.

Resident attitudes are characterized initially by shock and denial, followed by increased stress and other mental health issues, and finally by acceptance.

In a powerful example, Haskell and Randall (2009:49) conceptualize the history of Aboriginal peoples in Canada as having undergone a continual disruption of their attachments to the "the land, customs, culture, modes of self-governance, languages, and ways of life" due to policies of colonialism. They view these disruptions as resulting in complex psychological trauma for many victims lasting generations, resulting in post-traumatic stress, health problems, crime, substance abuse, violence, and other kinds of social dysfunction.

Breakwell (1983; 1986) and Twigger-Ross and Uzzell (1996) have hypothesized that preventing the disruption of closely-held place meanings may be an important motivator for human behavior. Indeed, place identity preservation has been found to motivate residents to oppose new development or land use change. Stedman (2002), in a study of lakeshore home owners in Northern Wisconsin, found that people with high levels of place attachment were most likely to exhibit "place-protective behavior" (opposition to a hypothetical increase in the number of residential units on the lake). He concluded, "We are most willing to defend places that are strongly tied to our identity and for which we hold negative attitudes ('important but threatened')" (Stedman, 2002:576). The work demonstrates that types of place meaning and levels of place attachment can be used to predict social action (see also Devine-Wright, 2009). Devine-Wright and Howes (2010) found that residents who associated their place with mentally restorative meanings were more likely to oppose development.

It should be noted that in the practice of sociology, disruption to closely-held facets of social and personal life (such as disruption to long standing social patterns, or changes in community status), has long been described as among the most important changes occurring in rural communities. Classical authors such as Maine (1861/2010), Tonnies (1887/2001),

Durkheim (1893/1933), and Weber (1925/1958) have emphasized the importance of disruptions to social patterns and organizations occurring during the transformation from rural and agrarian social life to an urban, industrial, and modern one. They describe the modernization process as upending traditions and ways of life as social roles and identities become less entwined with the traditional model of small groups made up of blood relations, close proximity, and a perceived similarity. Through modernization, people become more defined by their economic or occupational relationship to formal organizations comprised of otherwise heterogeneous individuals (Kasandra and Janowitz, 1974; Jobes, 1987; Warren, 1963).

3-1.4 The social disruption hypothesis

The western United States saw dramatic growth in energy development in the 1970s, with large oil, natural gas, coal, and uranium mines and associated industrial facilities developed across the western U.S. Many of these energy projects were sited in rural areas and small towns, giving rise to the "boomtown" phenomenon of rapid growth, taxed municipal services, and dramatic changes in social structure (Gilmore, 1976; Markussen, 1978). The community effects of energy development became known as the "social disruption" hypothesis (Murdock and Leistreitz, 1979), defined by England and Albrecht (1984:231) as "a period of generalized crisis and loss of traditional routines and attitudes. The crisis strikes individuals whose mental health, worldview and social networks may all be disrupted. It strikes at the organizational level where existing businesses and associations must struggle to meet the challenge of newcomers. It also reaches the community level as the homogeneous culture is disrupted and services are often taxed."

While the social disruption hypothesis has received criticism for being atheoretical and methodologically haphazard (Thompson, 1974; Freudenburg, 1976; Wilkinson et al., 1982), however others have noted the larger narrative of social disruption fits well within the oeuvres

of classical sociologists like Tonnies, Durkheim, and Weber, who described the problems associated with rapid social change stemming from modernization and the rural-urban transition (Cortese and Jones, 1977; Jobes, 1987; Krannich and Greider, 1990). Of the social disruption phenomenon, England and Albrecht (1984:234) wrote, “To summarize, some of a person's tie to others within the community, his or her attachment to the community, and his or her assessment of the quality of community services are assumed to be affected by the development boomtown conditions. However, the nature of the impact will depend on a person’s exposure to industrialization, urbanization, his or her modernity, and the length of residence in the community.”

While some sociologists have complained of this view as too idealistic (Wilkinson et al., 1983), small towns are commonly known for close-knit social structure and well-defined social patterns, as some families may have an identity and leadership role in the community that goes back generations. The dynamic of “newcomers and old-timers” is important in the social disruption literature; as newcomers enter into relationships within the community, organizations may become more formalized as shared histories are no longer present (Smith and Krannich, 2000, Salamon, 2003). Social roles, hierarchies of influence and status, and social class patterns may be altered. Certain groups and individuals may no longer wield the same level of influence they once did, and community members may find themselves forced into new social roles. Freudenburg (1982:159), in describing farmers and ranchers facing new development, said, “In most rural areas […] persons in agriculture have traditionally been the backbone of the local economy and have tended to exercise a good deal of influence in local affairs. With the new people (and new sources of income) flooding the area, the rancher’s symbolic position has been affected at least as much as their objective position has been” (Freudenburg, 1982:159). Researchers have viewed these close-knit social structures as acting as informal social control mechanisms; their disruption then leads to numerous social problems including crime, drug

abuse, mental illness, child abuse, and related problems (Durkheim, 1933; Short Jr., 1984; Murdock and Leistreitz, 1979; Parkins and Angell, 2011). "The strain between the old and the new is exercised around struggles over the physical and planned environments, participation in local organizations and in the style of life, literally how they dress, talk, drive and conduct themselves with others (Jobes, 2000:1)".

The social disruption hypothesis has been extended to rural communities across the globe undergoing rapid change from other types of development, including tourism (Park and Stokoski, 2009), slaughterhouses (Broadway, 2000), and gambling (Vong, 2009; Perdue et al., 1999). Rising energy prices have caused a new reinvigoration of energy extraction and the social disruption hypothesis has recently been revisited in new energy development contexts (Braiser et al., 2011; Anderson and Theodori, 2009; Jacquet, 2009; Lawrie et. al., 2011).

3-2 The risk of social disruption

While it is evident that rapid growth and change from energy development can create adverse social impacts, in a review of the early social disruption literature available at the time, Murdock and Leistritz (1979) note that the threat of impact can be among the greatest concerns among local residents. Anticipated impacts to social processes may be especially important. "Concerns that new residents will change the basic institutions and forms of organization in rural areas; that the values of independence, self-reliance, and concern for the environment will be altered; that the incidence of crime, drug abuse, divorce, and other disruptions and sources of conflict will increase, and that the very natures of the areas that rural people value will be permanently altered- these concerns are often expressed and are deserving of careful analysis" (Murdock and Leistritz, 1979:246). Kassover and McKeown (1981:48 emphasis added), describe research on mental health impacts from energy development in Gillette, Wyoming:

"Among the first specific stresses faced by residents of a boomtown are the anticipation and perceptions of the impending change. …*anticipation of change, may, in fact, produce more severe and/or different patterns of symptomatology than change itself* […] the continuing uncertainty about the actual levels of growth to be expected [from the development], residents may begin to feel less secure, less in control of the destiny of their community, and may behave as if the change has actually occurred."

Regarding the development of another mine in Colorado:

"Even though construction of the mine is still several years in the future, some residents of the county feel that increases in crime, mental health problems, and increased housing costs have already resulted from [the developer]'s announcement of its intentions. […] Thus, the mere threat of rapid growth may reduce the community's tolerance of newcomers unless successful programs are developed to help people maintain realistic perceptions of change." (Kassover and McKeown, 1981:49)

These anticipatory effects were measured by a longitudinal study of the energy impacted community of Delta, Utah (Brown, Dorius, and Krannich, 2005). The study found that community perception of negative impacts peaked during the initial stages of development, despite the fact that most of the growth did not occur for several years. Cortese and Jones (1977:86) note that for longtime residents the "cultural and social changes take a certain toll as they see a way of life slipping away or perhaps already gone" until a resident will "wake up one morning in his own bed but in a different town". Bacigalupi and Freudenberg (1983) performed an analysis on mental health caseloads in a boomtown and found that, on a per capita basis, the increase in caseloads came disproportionately from existing residents dealing with the stresses of a changed community.

A 2010 health impact study of a large natural gas drilling project in Colorado found that stress was among the largest health impacts that may arise from drilling activity. A major source of stress was worry over future changes to the community and social cohesion (Witter et al., 2010). Even though this development is years away from occurring – if it occurs at all -- the study reports that residents are already are concerned that "gas industry development will decrease the appeal of the community" (Witter et al., 2010:51).

3-2.1 Spoiled place identities

The idea that place-based identities can be spoiled by industrial development has long been observed in the context of siting of nuclear or hazardous waste facilities: while residents most prominently fear the health risks related to proximity to hazardous waste, they also fear that their community will become stigmatized, and take on a narrative of contamination (Omohundro, 2004; Broto et al., 2010; Hayden, 2000; Hunter and Sutton, 2004; Elliott and Taylor, 2006). One resident, dealing with impacts from nearby energy development, recently illustrated the phenomena by stating "I don't think the problem is our water is bad. I think the problem is everyone thinks the water is bad" (Dayton, 2012).

It is an impact on local residents that Edelstein (1988:43) calls a "lifescape change" as the stigma of contamination "profoundly effects how they think about themselves, their families and their world" and as their home and community has lost its identity as a "psychological refuge", even though most residents will not receive any kind of toxic exposure. Baxter et al. (1999:106) describe these as "psychosocial shocks" inflicted on residents from the announcement of the development and subsequent planning and siting process, and "residents' identities and security in traditional rural ways of life were the most dreaded threats from development." Lober (1993), in a study of hazardous waste facility siting, found that a resident's fear of losing individualistic values explained a large degree of the perception of risk from the

facility. Wheatley (1997), in a study of mercury pollution in Canadian aboriginal peoples, found that the stigma of pollution and the associated disruption to cultural identities of environmental health and well-being was more devastating to residents than were the clinical effects of mercury exposure (see also: Dyer et al., 1992).

3-2.2 The construction and maintenance of place and community meanings

The examples of community stigma given above are perhaps extreme in that they involve waste facilities and environmental catastrophes, and as such these stigmas are more likely to be widely shared throughout the community. Other, more common, examples of identity disruption may be much more subtle and contested, especially in cases like energy or real estate development where clear positive impacts from the development can also be identified. In these cases the meaning of the development and how it relates to place-based identities are influenced by social forces (Morscovici, 2000; Stokowski, 2002; Kyle and Chick, 2007; Bell and York, 2010), and the perception of risk to these identities (like the perception of other risks) is influenced by social life as well. Individuals navigate the influence of formal groups and institutions (such as energy companies, government agencies or local opposition groups) mediated by trust, expectations, and social influence. In the context of energy development, oftentimes it is energy firms that are engaged in framing how residents view the development as related to the narrative of their community (Birkland, 1998; Cheng et al., 2003). In the face of proposed large land use actions, organizations and political interests have an incentive to influence community and place meanings, and to influence the perception that a proposed development may put place-based identities at risk—or reinforce existing identities--similar to the “frame alignment process” in social movement literature (e.g. Mann, 1970; Snow et al., 1986).

Logan and Murdock (1987) show that successful land developers must teach local residents to value economic-based place meanings such as growth, employment, and commodity exchange, and to devalue other non-economic meanings such as sentimentality, social networks, or ethnicity. By attempting to convince residents that industrial activity is congruent with their resident community and place-based identities, these developers seek to reduce the magnitude of perceived risk (and increase perceived benefits) among individuals in the community. Logan and Murdock show through examples of failed land development proposals that residents with non-economic-based place identities are unlikely to support land development. Massey and Davidson (1983) assert that one of the first things to occur when an extractive industry enters a community is for landmen and community relations personnel to begin educating the residents on the economic benefits that will accrue to their families and the community, hence persuading them to value monetary exchange over any social or environmental implications.

Bell and York (2010:111) provide a case study of a coal mining town in West Virginia where – in the midst of wide-scale environmental degradation –the mining company methodically attempted to amplify the importance of the "economic identity" of the town and downplay competing narratives such as environmental health or recreation. The authors call these industry activities "identity maintenance" (2010:112), as an industry-funded organization called Friends of Coal attempts to show the company and the resource as deeply ingrained in the production of community and social identities. The Friends of Coal frame the mine as a critical source of employment and economic activity throughout the town's history, thus cementing itself in the identity of the townspeople, even though the mine has historically been a relatively small source of employment. This observation of energy company practices that has been made by other researchers (e.g. Massey and Lewis, 1979; McGraw, 2011). Gould et al.

(2004) describe this battle of narratives between jobs and ecological amenities as a hallmark of resource dependent communities.

Regardless of the actors involved, it is clear that residents of rapidly changing energy communities must adapt to changing narratives of local meanings. In describing an important several-decade-long longitudinal study on the boomtown of Delta Utah, Brown, Dorius, and Krannich (2005:34) describe importance of adapting and coping with a new shared community identity and social structure, such as "residents' ability to make subjective adjustments to the new conditions of their community—to reconcile its new emerging 'story' with previously established expectations and understandings." Gilmore (1976) also outlined stages of attitude that residents endure when adapting to rapid changes in community identity, and are in many ways are similar to the phases of identity disruption outlined by Brown and Perkins (1992) and Inhalan and Finch (2004). Summarized, Gilmore's four stages are: 1) Enthusiasm, as residents focus on job and income opportunities 2) Uncertainty, as the town starts to change; 3) Near Panic as the community character changes dramatically and is an affront to the community's historic way of life; and 4) Adaptation as residents begin to accept the reality of the situation at hand; some residents may move away, others may feel a sense of progress.

3-2.3 Understanding social-psychological disruption: enter risk analysis

Up until this point this paper has described the concept of social-psychological disruption and relayed both its importance and prevalence within literatures describing resident attitudes towards the prospect of change in their communities. Here, the paper addresses the measurement of such disruption and its integration with risk perception frameworks. Measurement is critical if the disruption of place and community-based identities will be useful in the realm of planning and siting large scale development.

Rigorous analysis of social impacts in general has long-received short thrift from environmental impact assessments and other types of environmental planning (Glasson and Heaney, 1993; Chadwick, 2002; Burdge, 2002; Baxter et al., 1999). A number of reasons likely underlie this omission (see Stedman, 1999; Beckley et al., 2002). The author assumes – as do others (Brion, 1988; 1991) – that in large part, this is due to an impression that social impacts – especially social-psychological impacts that are subjectively perceived – are viewed as difficult or even impossible to measure or predict. Many believe, uncritically, that because "social impacts are in the eye of the beholder" (i.e., not everyone perceives a certain change, risk, or impact, in an identical way) that systematic understandings are not possible. As such, subjective perceptions of quality of life have tended to not be integrated into risk analysis because they are perceived as lacking scientific credibility: such perceptions are perceived as residing within the individual, difficult (or impossible) to measure quantitatively, and not varying systematically across recognizable social groups. These perceptions are analytically far more difficult to engage: one needs to understand diverse reactions to a common triggering event, rather than simply focusing on the nature of the event itself.

However, as we have seen, such subjective perceptions are often and routinely measured in the discipline of risk analysis. As Slovic and Weber (2004:2) write "[Risk] does not exist 'out there,' independent of our minds and cultures, waiting to be measured. Instead, risk is seen as a concept that human beings have invented to help them understand and cope with the dangers and uncertainties of life. Although these dangers are real, there is no such thing as "real risk" or "objective risk."

While subjective impacts may indeed be in the eye of the beholder, this has not prevented risk researchers from engaging the systematic variation of these sentiments across meaningful segments of the population. Predictions are often made about the types and degrees of risk to health and property that might be perceived by certain individuals, based on

any number of socio-demographic and experiential variables or mediating forces. Risk analysis asserts that while people vary in their subjective perception of an impact or risk thereof, the variation is far from random, and can vary systematically across segments of the population. It is believed the same to be true among residents facing risks to other types of values, such as place-based identity.

3-2.4 Place (attachment) at risk?

Measurement of risk perception ranges from participant observation of gambling traits (Weber et al., 2001) to survey research measuring the fear of apocalyptic events (Slovic and Weber, 2002). Most risk perception metrics typically use a psychometric approach that asks respondents to rank the perceived likelihood that a particular risk will occur using a Likert scale of possible responses and assess the magnitude of the potential risk, often measured by asking the respondent to measure the acceptability of a potential risk event. (Rogers, 1997; De Weerdt, 2005; Baxter et al.,1999). It is noted that most people do not think in terms of specific risk events, so respondents are often prompted with specific categories of risk (i.e. often health or property related) (Rogers, 1997). The questions are often accompanied by hypothetical scenarios such as economic compensation, and the various responses are correlated with factors such as socio-demographic status, information sources, level of planning participation, etc to discern trends in how different segments of the population assess risk.

This overall framework of prompting residents to assess the risk or threat—beyond those health-related concerns typically invoked-- can work well if respondents were additionally prompted with other kinds of risk to social-psychological variables, and such an expansion “of what is at risk”. This would go a long way to measure the importance of these variables among residents in formulating attitudes towards land use changes, and the identification of patterns in how different types of residents asses these more broadly defined risks. The more difficult

question in applying this framework is identifying what social-psychological kinds of risks should the respondent be prompted to assess. The paper shall differentiate here between place/community meanings and place/community attachment.

3-2.5 Measuring place meanings

Place meanings are analytically distinct from attachment to place, and that these distinctions are crucial. Both established and emerging research defines meanings as cognitions, or "descriptive" statements about what the essence of a place is, i.e., "what kind of a place is this" (Kudryastev et al., 2011). For example, places can be "peaceful," "dangerous", or "growing", or they can be "workplaces" or "a place for shopping". Places can also have sentimental or emotional value, as they may symbolize family or personal history or more abstract ideas such as regional heritage or wilderness (Williams et al., 1992).

The study of place meanings has been traditionally more qualitative and ethnographic in nature (i.e. Relph, 1976; Steele, 1981; Tuan, 1974), however more recently categories of meaning have been established and operationalized using Likert scale items. Young (1999) used a five-point scale to rate how important 26 different place meanings such as "ecologically important" and "spiritually valuable" were to residents. Stedman (2002) used a 14-item Likert scale that measured categories of meaning such as "pristine", "community", "up north", and "impacted", among others. Kudryavtsev et al. (2011) employed a 12-item place meaning scale to explore ecological meanings of the south Bronx in New York City. Devine-Wright (2011) and Devine-Wright and Howes (2010) have used a similar 8-item Likert-type questions to measure symbolic place meanings categories such as nature (i.e. "nature is unspoilt at this place") and community ("it's the people that make this place what it is") (Devine-Wright, 2011). Davenport & Anderson (2005:632) compiled "a web" of meaning categories for a river system that included "identity", "nature", and "sustenance", and they note these meanings will change over time.

Manzo identified several categories (or “themes”) of place meaning in an urban setting that touch on sentimentality or personal identity, including “Privacy, introspection and self-reflection”, “Developmental/transitional markers” and “Bridges to the past”.

Because there nearly an infinite number of potential place meanings, there is a need to use exploratory methods such as focus groups (Devine-Wright, 2011), interviews (Davenport & Anderson, 2005), resident-employed photography or other media content analysis (Beckley et al., 2007; Stedman et al., 2004), or an assessment of local planning documents (Stedman, 2002) to ensure place meanings and categories of meanings are locally-generated and locally-relevant.

3-2.6 Measuring attachment

In contrast to place meanings, operationalizing and quantitatively measuring place attachment has received extensive treatment since the early 1970s. Ludtke and Burdge (1970), when studying the social impacts of forced migration due to dam construction, created the first place attachment scale, a 13-item scale asking respondents to respond on a Likert-scale ranging from Strongly Agree to Strongly Disagree to statements such as “of all the places I have been, I like this area the best”, “whenever I die, I would like to be buried in this area”, and “I think that I could be at home in any number of places away from here”. Ludtke and Burdge found that higher levels of place attachment as measured by the scale were correlated with increased apprehension about relocating from the area and establishing new relationships in a new community. Place researchers have since refined the place attachment scale to include sub-categories of attachment such as personal identity (“the area reflects the type of person I am”), and place dependence (“For doing the things that I enjoy most, no other place can compare”) (Jorgenson and Stedman, 2001; 2006; Scannell and Gifford, 2010).

Kasarda and Janowitz (1974) first measured community attachment in the context of urbanization and population density, asking questions regarding attachment (i.e. “how sorry or pleased would you be to leave?”, “how interested are you to know what goes on?”) along with quantitative data such as the number of friends and acquaintances in the community, the length of residence, social status, and life-cycle stage. Since that time many attempts to measure community and place attachment have been made (Giuliani, 2003), and importantly, level of attachment has been seen to correlate with (and be predicted from) a number of sociodemographic variables, most famously length of residence (Kasarda and Janowitz, 1974; Goudy, 1990), but also number of social ties, religion and other factors. (Brehm, 2007; Brehm et al., 2004; 2006).

3-3.6 Measuring place at risk

Perceived risks of energy development to important place meanings and place attachment can be measured using conventional tools of risk analysis: probability of occurrence and magnitude of impact. As such, these sorts of risks can and should be examined in parallel to other more commonly assessed risks (e.g., health and safety). For example, to measure probability in a hypothetical scenario, using a Likert scale of extremely unlikely to extremely likely, respondents may be asked “If the proposed development occurs in this area, how likely is it that the area will no-longer be a good place to raise children?,” or “If the proposed development occurs in this area, how likely will the area still have wilderness qualities?.” To measure magnitude of impact, respondents could be asked “using a scale from very happy to very unhappy, how happy or unhappy would you be if your community was no longer a good place to raise children?”, or how happy or unhappy would you be if your area no longer contained wilderness qualities? Further, respondents can be asked how these perceptions of risk may change under certain circumstances and if their level of local attachment may subsequently change due to changes in these place meanings.

Great strides over the decades have been made in measuring local meanings and attachments, however a more rigid and robust documentation of how place and community meanings are potentially changed by development, how residents perceive these changes, and the development-based (i.e., the type and magnitude of the development) or context-based (i.e., the nature of the community and the social actors therein) factors that may mediate this relationship is needed. With such analyses, advancements in the risk analysis discipline that involve the role of socio-demographic variables, communication, and social actors can illuminate these impacts and understand how overall support or opposition (whether at the level of the individual, the community, or both) is driven by perceived threat to important community identity and attachment.

3-3 Conclusion

This article has attempted to support and expand the recent arguments offered by several researchers (Wester-Herber, 2004; Devine-Wright, 2009; Phandke, 2011) that local opposition to land use changes such as energy development may be explained by the disruption to closely held place and community meanings and identities. While relatively neglected in the literature compared to more dramatic and tangible outcomes based in hazards and health, the disruption to closely held place and community meanings can be a real and potentially traumatic consequence of rapid land use change, and often it is the anticipated risk or threat of this disruption that is the cause of opposition or consternation among residents. Like other risks, actors in the planning process may attempt to manage and frame the perception of these potential disruptions.

Short Jr. hypothesized (1984:711) that social and psychological variables have been largely ignored from risk analysis because they had thus far “not generated a body of specialized research or theory”. It is hoped that this answer to his long-unanswered plea for a

risk analysis that engages risks to "the social fabric" has shown that there is indeed such a body of research and theory – even if at times disjointed – in the realm of social and psychological impacts. The discipline of risk analysis can dovetail with these well-established efforts to quantify and predict place and community meanings and attachments and such a combined effort can help to 1) identify and quantify the importance of place and community disruption vis-à-vis more commonly addressed health and economic concerns; 2) identify sociodemographic and experiential phenomena that help explain variation in disruption and the perception of disruption risk; and 3) explain the ways in which the perception of disruptions and disruption risk can be communicated and manipulated in the planning process.

Clearly, physical, environmental, social, and psychological factors all play important roles as people are faced with potentially transformative changes to their landscapes and communities. As noted by Short Jr. nearly 30 years ago (1984:711), such a risk analysis that attempts to holistically address all of these will broaden the discourse to include a more complete list of "valued and necessary aspects of human existence"

In the same article, Short Jr. also warned, " A more serious risk for all of the social sciences is that we will promise more than we can deliver, or that, having decided to engage the issues, we will assume a posture of advocacy rather than analysis, of ideological commitment rather than commitment to careful scientific and humanistic analysis" (1984:721). Alas, there is much to do to implement these new types of risk analysis. However, new energy development projects that promise transformative changes to the landscape and communities continue to rapidly be unrolled throughout world. Wind, solar, natural gas, tidal, carbon sequestration, oil sands, and even nuclear facilities are being constructed, and each offer different opportunities to measure, compare, and contrast the perception of social-psychological disruptions. Furthermore, a better understanding of social psychological disruption and incorporating these

understandings in the planning process can aid in reducing these disruptions and associated deleterious effects on the social fabric of communities.

3-4 References

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CHAPTER 4: PERCEIVED IMPACTS FROM WIND FARM AND NATURAL GAS DEVELOPMENT IN NORTHERN PENNSYLVANIA

Abstract

This study examines the environmental, social, and economic impacts perceived by landowners from the development of an industrial scale wind farm and extensive natural gas drilling in an area of Northern Pennsylvania. A mail survey (N= 1028) revealed that the types of perceived impact from wind and natural gas are similar overall, although the perceived magnitude of positive and negative impacts are greater from natural gas drilling. Impact perception was found to explain a large portion of resident's larger attitudes towards the energy developments, and resident's place meanings for the area also explain some attitudinal variation. Additionally, factors such as place attachment, and length and type of residency were found to have little or no effect on either the perception of impact or resident attitudes toward development.

4-1 Introduction

Wind farm and natural gas energy developments represent some of the most extensive and most contentious rural land use transitions occurring in the United States today. Technological innovations and high energy prices have spurred the construction of tens of thousands of industrial-sized wind turbines and hundreds of thousands of natural gas wells in the last decade (ORNL, 2011; US EIA, 2011). Continued domestic and global growth in both wind farm construction and the development of so-called "unconventional" gas resources is considered likely by many analysts (Paltsev et al., 2011; USDOE, 2008; Newell, 2010).

Meanwhile, the development of these energy sources can have large positive and negative impacts on the social, economic, and environmental fabrics of local communities. As

such, wind and natural gas projects have caused debate and opposition in many communities across the United States and the world (Phadake, 2011; Pociask and Fuhr Jr., 2011; Food and Water Watch, 2011). The costs and benefits of these energy sources are often framed differently; comparing and contrasting the types of specific impacts perceived by residents and how they influence overall attitudes towards development can offer clues as to how and why residents react towards the development of energy projects (Warren et al., 2005).

Resident attitudes towards change are often viewed as derived from an assessment of the costs and benefits (i.e. impacts) that residents perceive to have accrued, Understanding how and why local residents perceive of the positive and negative impacts from these energy developments – and ultimately support or oppose the projects – will become even more critical as these energy projects continue to expand and policy makers wrestle with the strategies to manage the permitting and development of diverse energy resources.

Although distinct energy sources, the construction of wind and natural gas facilities in the same area is no longer a rare occurrence – examples of wind and natural gas facilities located in close proximity to one another exist in Texas, Wyoming, Colorado, Pennsylvania, and other places. Further, the co-siting of these energy sources may be advantageous for energy production as natural gas is considered an ideal “load-following” energy source, helping to smooth the intermittency of wind energy fluctuations: increased natural gas power generation may in fact incentivize increased wind energy production (Regulatory Assistance Project, 2010).

During the last great energy boom in the United States – during the 1970s and early 1980s – great attention was paid by rural sociologists to the social and community impacts of energy development (Murdock and Lestritz, 1979; Krannich and Greider 1990). In recent years, the reemergence of wide-spread energy development in rural areas has led to renewed research interest in the impacts of energy development (Brasier, et al. 2011a; Parkins and Angell, 2011; Anderson and Theodori, 2009; Theodori, 2009; Jacquet, 2009). This recent

research often pertains to oil and/or natural gas operations and impacts associated with influxes of new workers, large royalties paid to some landowners (Jacquet, in press), and local environmental concerns (Wiseman, 2011; Colborn, et al., 2011). In contrast, much less research has been paid to the impacts from wind farm developments, especially in the United States. Wind farm development is often framed as affecting aesthetics (Pasqualetti et al. 2002), property values, or ambient noise levels (Jobert, et al. 2007), however most wind farm related research has focused on resident attitudes towards proposed construction and less research has examined the subsequent impacts from already constructed facilities.

The underlying reasons for diversity in impact perception and concern have been the subject of some academic treatment in the past. This focus, however, has largely been unrelated to energy development. Variables such as length and type of residency (Girard and Gartner, 2003; Kasarda and Janowitz, 1972), place attachment (Burge and Ludtke, 1972; Williams, et al. 2009), and the type of place they perceive the area to be (Kaltenborn 1998; Stedman, 2003; Devine-Wright 2009) have been found to influence the perception of impacts from a broad array of factors such as population growth, land use change, and environmental change.

This article describes the results of a 2011 mail survey measuring resident perception of types and magnitudes of social, economic, and environmental impacts associated with industrial-scale wind farm and wide-scale natural gas development in rural Northern Pennsylvania, and the relative contribution of each of these impact perceptions on overall project support or opposition. The area has experienced heavy natural gas development since 2009, and a 67 turbine wind farm was constructed there in 2010. Multiple energy firms are planning additional wind and gas development. This article provides an in-depth comparative analysis of the impacts perceived from the construction of these energy installations, and

compares these perceptions based on key elements drawn from theory on how different types of residents respond to environmental and land use change.

4-2 Literature Review

Both natural gas and wind are often depicted as medium to long-term solutions to climate change. Wind typically is described as a source of carbon-free "green energy" (Warren et al., 2005), while natural gas is often referred to as a reduced-carbon "bridge-fuel" to a green energy future (Hultman, et al., 2011; Paltsev et al, 2011). Yet, in spite of this pro-environmental framing, wind and gas projects are often opposed by environmental groups, especially at the local level (Groothuis et al. 2008, Warren et al., 2005). Both opponents and supporters can "claim the mantle of environmentalist" (Groothuis, et al., 2007:1545), and it is clear that both local environmental costs and larger environmental benefits are strong factors in the siting of these projects (Wolsink, 2005). Wind and gas industries share many land use characteristics of small-acre development sites connected by transmission lines and access roads. Accordingly each is seen as contributing to the larger phenomenon of "energy sprawl" (Johnson, 2011; McDonald et al., 2009). Development sites are typically leased from an array of private landowners and the landowners are paid additional royalties for energy that is produced. Both energy sources also share a similar life cycle, exhibiting short but industrially-intensive construction phases followed by two or three decades of less intensive energy production. Both gas and wind have been noted in rural areas as potential drivers of economic growth and prosperity (Kelsey et al, 2011; Slatterly et al., 2011).

4-2.1 Impacts from energy development

Natural Gas Development

Research on impacts of natural gas drilling and other types of fossil fuel development grew to prominence in the late 1970s during a period of high energy prices and a boom of

energy development in the western United States. Much of this development was situated in rural and oftentimes isolated communities, and concerns centered on rapid population growth and the associated changes in social structure and quality of municipal services (Murdock and Lestritz, 1979; Krannich and Greider 1990; Gilmore, 1976). Thompson and Blevins (1983) found that most residents of impacted communities viewed economic impacts to be positive, most social impacts to be negative, while concerns about environmental impacts were mixed. They also noted that economic optimism tends to decline with energy development experience. Economic opportunity is represented by jobs and increased business activity, while social impacts typically perceived by residents and tallied by sociologists concerned increased crime and substance abuse (Greider and Krannich, 1985; Kohrs, 1974; Gilmore and Duff, 1975), decreased mental health (Bacigalupi and Freudenberg 1983), a decrease in the number and quality of social relationships (Freudenburg 1986), and a transformation of social roles in the community (Jobes, 1986). With a few exceptions (i.e. Thompson and Blevins 1983), sociological research on environmental change received much less scrutiny during that time.

More recently, unconventional natural gas development that utilizes horizontal drilling and high-volume hydraulic fracturing technologies (or "fracking") has rapidly proliferated in areas across the US. Public debate over gas drilling has largely centered around the health and environmental risks gas drilling pose, especially a used in the fracking process (Wiseman, 2011; Colborn, et al., 2011; Theodori et al, 2011). The social impacts of unconventional drilling have received some attention as well: Theodori (2009) found that community leaders in impacted areas of Texas perceived substantial risk to drinking water from chemicals. Further, increased truck traffic, freshwater consumption, high tax rates, and environmental pollution were some of the largest impacts experienced. Jacquet studied impacts of unconventional natural gas development in Wyoming, and found increased rates of crime, cost of living pressures, and decreased quality of life assessments among longer-term residents (Jacquet 2005; 2009), while

also resulting in the emergence of landowner-based collective action (Jacquet and Stedman 2011). A team of sociologists from Penn State and Cornell Universities implemented a 2009 mail survey and conducted long-form interviews in Pennsylvania and New York State to study resident expectations from gas drilling that had yet to occur in most areas: the survey found residents expected drilling to provide positive economic impacts, negative environmental and municipal impacts (including an expectation that drinking water will "get worse"), and high levels of uncertainly about social impacts (Stedman et al., 2011; Brasier et al. 2011a).

A number of studies have found that residents of communities that have undergone natural gas or other kinds of fossil fuel energy development typically temper their overall perceptions of impact magnitude—positive or negative-- as development unfolds. Perceptions of economic benefits (especially prospects for employment within the industry) become less positive as time goes on (Thompson and Blevins, 1983; Brasier et. al., 2011a; Murdock and Leistritz, 1979; Anderson and Theodori, 2009), while negative aspects are also viewed as 'not as bad' with increased development experience (Brown, Dorius, and Krannich, 2005).

Wind Energy Development

Modern, industrial-scale wind development has become prevalent only in the past decade or so; accordingly, research on the full range of social, economic, and environmental impacts that are perceived from the construction of wind farm development is less established, especially in the United States. Most research has looked at resident attitudes towards the planning and siting of wind farm development, as well as an investigation into the types of impacts that residents expect to occur (Naidi, 2007).

Concerns over aesthetic impacts of wind farm instillations are most often cited: the places where the wind resource is most abundant (ridgelines, coastlines, etc) are also the areas where the large wind turbine towers are the most noticeable (Pasqualetti, et al., 2002,

Johansson and Laike, 2007, Jobert, et al. 2007; Swofford and Slatterly, 2010). Nearby landowners also express concern over impacts on property values (AGO, 2009). These concerns appear to be overstated in comparison to actual impacts; while some site-specific studies have found negative impacts on property values, a nation-wide study on the sale of 7,500 single family homes within 16 km of a wind farm found no conclusive evidence of any widespread effect on property values (Hoen, et al., 2009; Hoen, et al., 2011). Similar concerns have been expressed on the effects of wind farms on local tourism, although evidence of a tourism decline in areas where wind farms have been built is also scant (Landry, et al., 2010). The effects of low-frequency wind turbine noise has gained greater prominence as of late, and several scientific studies have found that significant minorities of residents near wind turbines report stress and sleep disturbance from turbine noise (Bolin et al., 2011).

A number of studies have recorded post-construction perceptions of wind farm development, and attitudes toward wind farms have been found to fluctuate over time, with positive attitudes declining after a specific wind farm is proposed, but—in contrast to gas development-- becoming much more positive after the facility is constructed (Devine-Wright, 2005; Wolsink, 2005; Braunholtz, 2003; Jobert, et al., 2007).

4-2.2 Impacts vs. Perceptions of Impact.

It is important to note the difference between documented socioeconomic changes and the perception of impact, as one does not necessarily denote the other. For example, changes in crime rates may be measured via arms-length indicators: e.g., by analyzing law enforcement and population databases; however resident perceptions of changing crime rates may differ significantly from what the data show (Hunter, et al. 2002). In the social sciences it is often said that “perception is reality” (Berger and Luckman,1966); and the perception of change can lead to real changes in quality of life, stress, mental health, and subsequent behavior (Freudenburg

and Jones, 1991). In the realm of assessing impacts from land use change, it is widely regarded that measuring resident perception of impacts can be as important (or even more important) then the impacts themselves (Burdge 1994; Gramling and Freudenburg 1992; Dillman and Tremblay, 1977). Greider and Krannich (1985: 15) importantly note that subjective data such as resident perceptions are often much more salient measures of community change – and better predictors of behavior--than statistical measures of population change or service provision:

> "That is, individuals must perceive, classify, and transform objective conditions into meaningfully relevant phenomena therefore these conditions become pertinent in the analysis of community satisfaction and perceptions of community quality. Accordingly, assessments of social problems accompanying rapid growth should incorporate a focus on residents' interpretations of the conditions and changes which may exist in impacted communities."

Resident perceptions may offer insights into the socio-cultural contexts present within in the community, and such "subjective" data can be useful in measuring community wellbeing both pre- and post-development (Stedman, 1999; Beckley et al 2002) and can indicate the acceptance of policy initiatives (Lankford, 1994). In other cases, especially in rural areas, resident perception of impacts may be among the only assessments available as objective information is often difficult to obtain, either because it is not tallied regularly, the geographic scale of interest is finer than that afforded by data collection protocols, or due to time lags between data collection and the ability to use it (Greider and Krannich, 1985; Burdge, 1994).

4-2.3 Factors Affecting Concern

How and why different groups of people perceive risks to environment and health differently has been the subject of some research. Sociodemographic factors such as age,

gender, length and type of residency are thought to influence perception to things like health and environmental risks (Slovic, 1987). Davidson and Freudenburg (1996) describe a “white male effect”, where women and people of color often are more concerned about numerous environmental risks, particularly those that relate to local issues.

Community attachment, a multidimensional evaluative concept thought to be based on factors such as length of residency, strength and number of social ties, has been found to influence on the types of impacts perceived (Kasarda and Janowitz, 1972; Beggs, Hurlbert, & Haines, 1996; Goudy, 1990). Perceptions have been shown to vary based on factors such as the respondent’s relationship and attachment to the area as measured by factors such as length and type of residency (i.e. permanent or seasonal) (Girard and Gartner, 2003), place attachment (Williams, et al. 2009), and place meanings, or the type of place they perceive the area to be (Kaltenborn 1998; Stedman, 2003; 2008). For example, Brehm et al. (2006) found that, in the rural communities in the Rocky Mountain West, residents were largely attached to either social or environmental aspects of the community, and social attachments corresponded with a desire to protect long standing cultural traditions, while environmental attachments corresponded with environmental protectionism. They note that these types of attachments explained resident attitudes towards development far better than various demographic factors.

While most of these studies have been performed in contexts such as amenity development, Devine-Wright (2009; Devine-Wright and Howes 2010; 2011) has found that in the case of wind energy, the place meanings that residents have traditionally imbued on the impacted area can affect perceptions of impact from development, especially if they fear that these meanings may be disrupted by the new development. For example, if residents associate meanings of an environmental or restorative nature with the area, they may view the impacts from the development as larger and more unacceptable. Conversely, residents who view the area as embodying meanings that represent opportunities for economic growth, for example,

may view the impact from the development as congruent with these meanings, and the impact smaller and more acceptable.

4-3 Research Objective

Little data exist on the actual impacts that residents perceive from the development of wind farms or modern forms of natural gas drilling; no research that we have found has compared perceptions between these two energy sources in the same setting. Therefore, the main questions guiding this research are: 1) What are the specific types of impacts that residents perceive from wind farm and natural gas development? ; 2) How is impact perception related to overall attitudes toward the developments?; 3) what are the attitudinal, experiential, and socio-demographic drivers of these perceptions, and how does impact perception differ systematically amongst different kinds of people; and (4) how do the above differ between natural gas and wind development?

4-4 Methods

4-4.1 Study Site

Spanning Tioga and Bradford Counties in the Endless Mountains region of northern Pennsylvania, the Armenia Mountain region consists of a highly-visible mountain ridge (elevation approximately 2000' above sea level) surrounded by a mix of small towns, agricultural and forested lands, and amenity-rich natural areas (figure 1). The area was chosen for study because it (unique in the eastern US) contains intensive natural gas development and a prominent wind farm facility, and additional gas and wind development have been proposed in the area.

The Armenia Mountain Wind Farm, operated by international energy firm AES, consists of 67 1.5 megawatt (MW) turbines constructed in 2009-2010 on top of the mountain ridge, with

plans for an additional 56 turbines to be constructed in the coming years. The average tower height is 118m. Multiple substations, over-ground and under-ground transmission lines, metrological towers, and approximately 25km of access roads over a total area of about 10,000 acres have been constructed. Land ownership in the immediate area is comprised of 117 private parcels under lease by AES (AES, 2007).

Natural gas drilling activity in the area is being conducted by several energy firms targeting the unconventional Marcellus Shale gas formation, with 934 shale gas wells drilled between January 2009 and September 2011 within 16km of the Armenia Mountain wind farm area. This region of northern Pennsylvania has emerged as much more geologically attractive for development than many other parts of the Marcellus Shale. Of the 934 wells drilled, 96 were drilled on or immediately adjacent to private parcels that also contain wind turbines (PA DEP 2011).

Approximately 10,000 people live year-round within 16km of the wind farm, including within 6 small towns (called “boroughs” in Pennsylvania) (U.S. Census Bureau, 2011). The borough of Mansfield, located in Tioga county and home to Mansfield University, is the largest municipality in the area with a population of 3,625, followed by Troy in Bradfield County, with a 2010 population of 1,354. Armenia Mountain ridge itself is among the most rural areas of Pennsylvania, comprised mostly of vacation homes, hunting cabins and unimproved tracts of land. The total year-round population on Armenia Mountain was 180 in 2010.

Like much of the northeastern United States, the area is experiencing a trend of afforestation as agricultural use declines (NYSDEC 2010). While the immediate area around Armenia Mountain has had a primarily agricultural past, the region overall is often considered part of the post-industrial Rust Belt, and has suffered from poor economic conditions during the latter half of the twentieth century (Thomas and Smith, 2009). The population of Tioga and

Bradford Counties decreased by 0.6% between 1980 and 2010 (U.S. Census Bureau, 2011). Tourism remains an important contributor to the economy, especially during hunting and fishing seasons, and nearby Pine Creek Gorge (referred to by tourism promoters as “the Grand Canyon of Pennsylvania”) attracts visitors of all types. There are emerging concerns that gas drilling activity, and the associated limited availability of vacant motel rooms, is having a detrimental effect on the tourism industry (Rumbach, 2011).

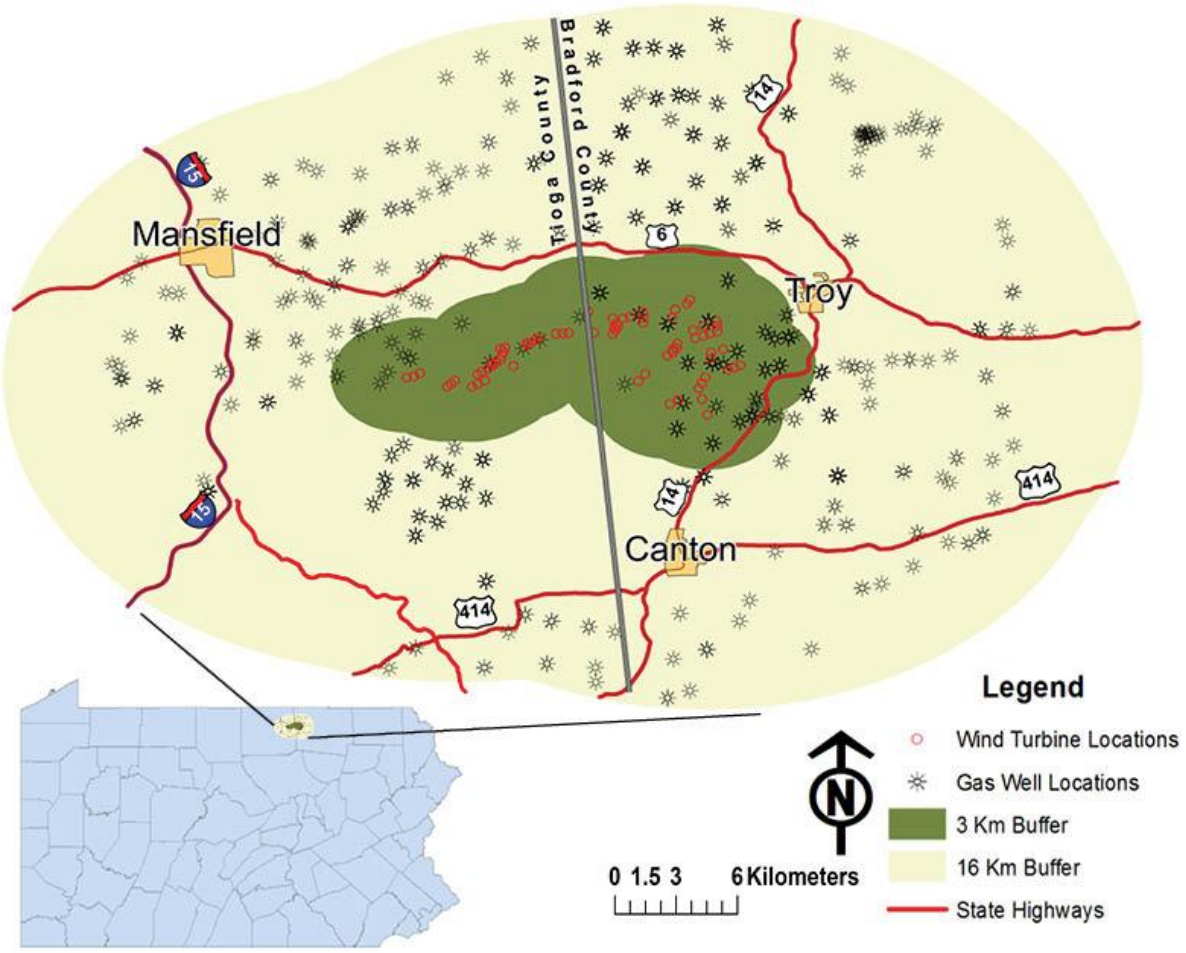

Figure 4-1: Depiction of the study area. The state of Pennsylvania is shown in inset. Note: In many instances, due to wells drilled in close proximity, Gas Well Location symbols closely overlap each other.

4.1.1 Comparative and Cumulative Effects

As energy development in this area has only occurred for only a few years, little secondary data are available that demonstrate the socio-economic changes (e.g., on employment, housing costs, migration rates) from the wind farm and/or natural gas drilling in the Armenia mountain area. Alternatively, a good deal of anecdotal evidence exists that both energy projects produced an influx of workers and an increase in industrial activity. Employment and business opportunities have been noted in the local and national media, as have been concerns over increases crime, costs of housing, and changes in community character (Lowenstein, 2009; 2010; Hargreaves, 2010). It is evidence that, while largely anecdotal, is similar to the effects documented by sociologists in other areas experiencing rapid natural resource development (i.e. Murdock and Leistritz, 1979). A tally of newspaper coverage from the nearby daily newspaper, the Towanda *Daily Review*, shows that natural gas drilling received vastly more newspaper coverage than the wind farm. 75 articles containing the words "wind farm" or "turbine" were published in the paper from Jan. 1st, 2006 to Sept 1st, 2011. Meanwhile, the paper ran over 250 articles containing the words "gas drilling" or "Marcellus Shale" during a one-year period ending April 30th, 2011 alone. With nearly 20 times more gas wells constructed in the study area then wind turbines, the discrepancy is not entirely surprising, and it is clear that in many respects the effects of gas drilling activity have largely dwarfed the effects felt from wind farm construction. Yet a cumulative impact from both gas and wind in terms of traffic, worker-influx, and cost of living pressures is evident.

4-4.2 Survey sample

Publicly available property tax databases and ArcGIS software were used to obtain geo-spatial information, land use characteristics, and landowner mailing information for all parcels within a 10 mile (16km) region around the Armenia Mountain Wind farm in Tioga and Bradford

counties. All commercial, industrial, and publicly-owned parcels were removed from the sample. After duplicate land owner names and mailing addresses were removed, a total population of approximately 8,000 property owners owning parcels classified as residential, agricultural, and recreational was identified, of which a survey sample of 1,800 property owners was selected. Natural gas drilling activity is relatively evenly distributed across the survey area, while wind farm activity was limited to an area with a relatively low population. To avoid a low total response among landowners at or near the wind farm, all 570 landowners who owned property within approximately 3km of a wind turbine were selected as part of the survey sample, while an additional 1,230 property owners were randomly selected from the remaining landowners within the larger 16km region. Latitude and longitude coordinates were obtained for all wind turbines and gas wells, and resident distance or proximity was measured from these coordinates to the geographical center of the land parcel.

A mail survey was designed and implemented in the spring of 2011. In April 2011, an initial copy of the survey was mailed to respondents, followed by reminder letter, followed by another copy of the survey, followed by a final reminder (Dillman, 1978). Few (49) of the 1,800 surveys were reported as undeliverable; of the remaining 1,751 surveys, 1,028 were returned, achieving a response rate of 58.7%. In the end, respondents within 3km of the wind farm had a higher response rate (359 responses, or 63.0% returned) compared to those outside of this area (669 responses, or 54.4% returned). The results were thus re-weighted to ensure respondents beyond 3km of the wind farm were not under-represented.

4-4.3 Questionnaire Items

Perceived Impacts of wind and gas

All survey respondents were asked to complete impact matrices consisting of 23 variables each that were equivalent across wind farm development and for natural gas drilling.

These variables (a 24th variable of "water quality" was added to the natural gas drilling matrix) were chosen to reflect the array of economic, social, and environmental concerns identified in the historical and contemporary sociological literature on energy impacted communities, as well as other concerns (i.e. health impacts, water quality, etc) that that emerged through interviews and informal discussions with residents of the affected area. Respondents were asked "how the [energy source] has changed certain facets of the study area" by marking one of five boxes for each variable ranging from "Very Negative", "Negative", "Neither Negative Nor Positive", "Positive", and "Very Positive". A factor analysis was performed on the impact variables for both energy sources, and in both cases the variables loaded onto four separate components, interpreted to represent environmental impacts, socio-community impacts, personal impacts, and economic impacts (Table 1). For both wind and natural gas, the amount of variance in the item pool explained by the factor loadings was greatest for the environmental impact category (36.1% for the wind farm; 45.8% for gas drilling) and much lower for the other categories (in the 4-8% range). All factors demonstrated acceptable reliability, with the lowest Cronbach's Alpha value at .720 (Table 1).

Place Meanings

Building from previous studies on place meaning research (Kudryastev et al. 2012), 13 different place meanings were devised: (e.g., "tourist destination", "wilderness qualities", "close-knit", etc). Survey respondents were asked "To what extent do you agree or disagree with the following statements about the study area?". A factor analysis was performed on these place meanings, and the variables loaded onto 4 different components, interpreted to represent "environment/restorative", "community", "integrated", and "threatened" (Table 4-1). As with the impact measurement, the "environment" category of place meanings achieved the greatest explained variance and highest Cronbach's Alpha measure of reliability (30% and .800,

respectively). The “integrated” category, comprised of two place meanings “tourist destination” and “industrial area” achieved a poor Cronbach’s Alpha score of only .317.

Table 4-1: Categories of Place Meaning

	Mean	Std. Dev.	Cronbach’s Alpha	Variance Explained
Environment/Restorative	4.27	.596	.804	30.18%
Wilderness Qualities	4.30	.694		
Good Place to Get Away	4.22	.800		
Outstanding Natural Beauty	4.47	.663		
Great Recreational Opportunities	4.11	.836		
Community	3.77	.663	.742	13.43%
Very Friendly	4.02	.780		
Close Knit	3.82	.820		
Newcomers Welcome	3.48	.848		
Vertical Integration	2.59	.789	.317	11.64%
Tourist Destination	2.95	1.105		
Industrial Area	2.24	.936		
Threatened	3.02	.768	.768	9.47%
Poor Environmental Health	2.32	1.03		
Economic Decline	3.73	1.02		

Question: “To what extent do you agree or disagree with the following statements about the study area?” Possible Answers: 1 = Strongly Disagree; 2 = Disagree; 3 = Neither Disagree or Agree; 4 = Agree; 5 = Strongly Agree

Attitudes towards development

Attitudes towards each form of energy development were ascertained via four questions for each energy source that asked respondents to rank, on a 5 point scale, how positive or negative they felt towards the current development, towards future development, how their attitudes changed during the development, and how the development changed their attitudes towards the use of the energy source in general (Table 3). The attitudes were combined to a composite scale to create an overall measure of attitude towards each of the two developments. The scale achieved high Cronbach’s Alphas of .917 for attitudes towards the wind farm and .939 for attitudes towards gas drilling.

Place Attachment and Residency Status

The survey utilized a 6-item scale (a reduced form of that in Stedman, 2003) to measure resident place attachment (table 4-2). Respondents were asked to indicate whether they strongly degree, disagree, neither disagree nor agree, agree, or strongly with statements about the local area such as “It is my favorite place to be”, “For the things I enjoy most, no other place can compare”, etc. (see table 9 for all of the items). The combined composite scale produced a high degree of reliability, achieving a Cronbach’s Alpha of .940.

Table 4-2: Place Attachment Scale

	Mean	Std. Dev.	Cronbach’s Alpha
Attitude Scale	3.98	.779	.940
It is my favorite place to be.	4.18	.847	
For the things I enjoy most, no other place else can compare	3.85	.951	
Everything about it is a reflection of me	3.76	.936	
I feel happiest when I am there	4.02	.869	
It is the best place to do the things I enjoy	3.97	.911	
I feel I can really be myself there	4.13	.811	

Question: To what extent do you agree or disagree with the following statements about the study area? Possible Answers: 1= Strongly Disagree; 2 = Disagree; 3 = Neither Agree nor Disagree; 4 = Agree; and 5 = Strongly Agree

Respondents were additionally asked if their property was a permanent residence, a seasonal residence, or land without a residence. They were additionally asked how long they have owned property in the area and how many acres they owned.

4-4.4 Sample representativeness

Using property tax databases as a survey sample provides both advantages and disadvantages. While detailed land use characteristics, accurate name and address information, and precise geospatial information is available from such databases, the database

is also limited in several ways, the most obvious of which is that only property owners are represented. The 2010 Census showed that approximately 25.7% of residences in the survey area were renter-occupied, and these residents were not included in the survey sample. Additionally, the majority of names in the property tax database were male, even though the 2010 Census reports that 52% of residents in the survey area were female. 75% or more of the property owner names in the database were listed with either solely a male name or with a male name listed as the primary addressee. Such gender disparity is unfortunately common in survey research, especially in rural areas (Jacobson, Brown and Scheufele, 2007), and the responses to the survey reflect this disparity, with 69.0% (709) of respondents selecting their gender as Male, 27.7% (285) Female, and 3.3% (34) with no gender selected. As is discussed below, however, gender did not appear to be correlated with attitudes toward the energy development.

Additional Respondent Characteristics.

The U.S. Census Bureau reports that 13.2% of the population of the two county area has some high school education, 33.7% has a high school diploma, 44.8% has some college education, and 8.2% has a Bachelor's degree or higher (U.S. Census Bureau, 2011). The survey respondents reported 5.2%, 32.0%, 30.3%, and 32.4%, respectively, showing the survey respondents were far more likely to have a college degree than the survey area population. The median age of the survey respondents was 59 years old, while the census reported that the average age of people aged older than 18 in the survey area was 58 (U.S. Census Bureau, 2011).

4-5 Results

Results of this survey reported in Chapter 2 have shown that residents were relatively neutral in their attitudes toward construction of the wind farm (with nearly 40% reporting that it

had neither a positive nor negative effect on the area). In contrast, attitudes towards natural gas drilling were more polarized and became much more negative in nature as development occurred (Table 4-3). For gas drilling the attitude mean was 2.77 for gas drilling compared with 3.10 for the Wind Farm. For the question on attitudes changed since development occurred, the mean for gas drilling was 2.66 compared to 3.17 for the wind farm.

Table 4-3: Scales of Resident Attitude Towards Energy Development

	Mean		Std. Dev.		Cronbach's Alpha	
	Wind Farm	Gas Drilling	Wind Farm	Gas Drilling	Wind Farm	Gas Drilling
Attitude Scale	3.10	2.77	1.123	1.327	.917	.939
Attitude Towards Existing Development	3.01	2.78	1.161	1.384		
Attitude Towards Additional Development	2.93	2.79	1.262	1.431		
Effect on How View Energy Source in General	3.33	2.89	1.306	1.480		
How Attitudes To Development Changed	3.17	2.66	1.285	1.471		

Possible Answers: 1 = Very Negative; 2 = Negative; 3 = Neither Negative nor Positive; 4 = Positive; 5 = Very Positive

4-5.1 Perceived Impacts

A main objective of this survey was to measure the types of impacts perceived from both wind and natural gas development (Table 4-4). Overall, the results show a number of similarities in the types of impacts perceived. Respondents indicated that community impact, personal impact, and environmental impact factors were negatively affected by both wind and gas development, although the impacts were perceived as more negative for natural gas drilling (Table 4-4), differences that were measured by the Games-Howell post hoc test to be significant at $p < .01$. In direct contrast, perceived economic impacts were largely neutral for wind farm development (mean of 2.98 out of 5), while they were quite positive for natural gas drilling achieving a mean of 3.64. (Possible choices and consequent coding valuation were "Very

Negative" =1, "Negative" =2, "Neither Negative Nor Positive" = 3, "Positive" = 4, and "Very Positive" = 5).

Table 4-4: Perceived Impacts (Grouped by Factor)

	Wind Farm				Gas Drilling			
	Mean	Std. Dev.	Cronbach's Alpha	Variance Explained (factor analysis)	Mean	Std. Dev.	Cronbach's Alpha	Variance Explained (factor analysis)
Environmental Impacts	2.63	.660	.845	36.17%	2.30	.809	.911	45.82%
Hunting/Fishing	2.55	.787			2.37	.913		
Outdoor Recreation	2.63	.767			2.42	.903		
Scenic Beauty	2.42	.984			2.11	.913		
Environmental Health	2.93	.676			2.28	.913		
Community Impacts	2.88	.716	.824	8.14%	2.67	.679	.887	6.97%
Sense of Community	2.90	.639			2.94	.832		
Attachment	2.97	.790			2.68	.882		
Social Relations	2.96	.547			2.79	.747		
Trust in Local Government	2.65	.790			2.40	.901		
Trust in the Energy Developer	2.72	.912			2.30	1.035		
Pride in the Community	3.15	.777			2.99	.910		
Quality of Government Services	2.80	.610			2.59	.823		
Personal Impacts	2.71	.485	.725	6.55%	2.31	.696	.846	5.70%
Noise	2.58	.795			2.14	.973		
Crime	2.89	.563			2.37	.870		
Traffic	2.51	.967			1.80	1.208		
Quality of the Water	---	---			2.27	.926		
Local Energy Prices	2.59	.826			2.53	.921		
Cost of Living	2.77	.740			2.44	1.009		
Resident Health	2.97	.495			2.63	.797		
Economic Impacts	2.988	.471	.740	5.69%	3.64	.802	.759	4.40%
Property Values	2.81	.740			3.46	1.194		
Area Employment	3.25	.678			4.04	.810		
Economic Health	3.16	.622			3.42	1.015		
Agriculture Industry Health	2.89	.599			2.57	.945		
Tourism Industry Health	2.84	.710			2.62	.850		
Non-loading Impacts								
Quality of Life	2.89	.640			2.65	.924		

Mean: "Please identify how the (energy development) has changed certain facets of the study area?" Possible Answers: 1 = Very Negative; 2 = Negative; 3 = Neither Negative nor Positive; 4 = Positive; 5 = Very Positive

"Area Employment" was considered the most positive impact from both wind and natural gas, while "Effect on Area Scenic Beauty" and "Amount of Traffic" were the most negatively affected variables for both energy sources, although the magnitude of impact was reported as greater for gas drilling (both positively and negatively).

Bivariate correlations between the types of impacts perceived and attitudes towards energy development indicate strong bivariate relationships between impact perception and attitudes (table 4-6). Environmental and Community impacts correlated most strongly with attitudes towards both Wind and Natural Gas, with correlation coefficients equaling .714 and .704, respectively for natural gas, and .633 and .673, respectively, for wind, with all correlations demonstrating 2-tailed statistical significance at the .01 level.

4-5.2 Place Meanings

Respondents most agreed with statements about the community that corresponded with environmental or restorative meanings, followed by statements that stressed community cohesion, economic linkages with larger society, and finally with environmental and economic threats (Table 4-1). One might presume that the type of perceived impact would be strongly related to the associated place meaning category (e.g. environmental impacts would be most strongly perceived among those who agree with environmental meanings); however, the empirical relationship between level of agreement with particular place meanings and the types of perceived impacts was relatively small and not statistically significant in most cases (Table 4-5). An exception was respondents who had a strong affinity for the "threatened" place meaning (comprised of "poor environmental health" and "economic decline") were more likely to view the impacts of both wind and gas development as negative across all impact categories. Additionally, respondents who emphasized place meanings related to community were more likely to view the impacts from both gas and wind development to be positive across all

categories. Correlations with overall attitudes towards the developments wielded similar results, with the "threatened" showing the strongest relationship with attitudes towards natural gas (the more respondents agreed with the place meaning, the more negative their attitudes toward gas drilling) (Table 4-6).

Table 4-5: Bivariate Correlations between Impact Categories and Place Meanings

	Place Meanings			
Impact Category	Environmental	Community	Vertical Integration	Threatened
Wind Farm				
Environmental	-.048	.063	.110**	-.101**
Community	.029	.158	.074*	-.073*
Personal Cost	-.014	.088**	.080*	-.103**
Economic	-.009	.081*	.030	-.097**
Natural Gas				
Environmental	-.101**	.075*	.089**	-.200**
Community	-.050	.179**	.083**	-.187**
Personal Cost	-.070*	.103**	.054	-.219**
Economic	-.023	.083**	.033	-.184**

4-5.3 Place Attachment and Residency Status.

Overall, the bivariate results suggest that the place attachment scale and residency status appears to play a very marginal role in resident attitudes towards energy development (Table 4-6), counter to some previously published research that has emphasized the importance of these variables. Length of residency was weakly correlated with attitudes towards natural gas drilling, as those with a longer history of residency were somewhat more likely to support development (table 4-6). Meanwhile, residency type did correlate with attitudes towards the wind farm, as persons with seasonal residences tended to have more negative attitudes than persons with permanent residences, perhaps suggesting harm to amenity or environmental-related values.

Table 4-6: Bivariate Pearson's Correlations with Energy Development Attitude Scales

	Gas Drilling Attitude Scale	Wind Farm Attitude Scale
Gas Drilling Attitude Scale	1	.282**
Wind Farm Attitude Scale	.282**	1
Seasonal Residence	.024	-.125**
Length of Residency	.105**	.078*
Acres of Land Owned	-.023	.005
Place Attachment Scale	.065*	-.004
Environmental Place Meaning	-.045	-.011
Community Place Meaning	.087**	.078*
Integrated Place Meaning	.028	.107**
Threatened Place Meaning	-.191**	-.035
Natural Gas Community Impacts	.714**	.276**
Natural Gas Environmental Impacts	.704**	.294**
Natural Gas Personal Impacts	.555**	.233**
Natural Gas Economic Impacts	.692**	.194**
Wind Farm Community Impacts	.290**	.633**
Wind Farm Environmental Impacts	.318**	.673**
Wind Farm Personal Impacts	.248**	.458**
Wind Farm Economic Impacts	.301**	.571**

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

4-5.4 Multiple Regression Analyses

Using impact perception to predict attitudes towards Energy Development

The direct, linear effect of all variables on attitudes toward development was determined using multiple regression analysis, and was shown to explain a large amount of variation in resident attitudes towards both gas and wind (Tables 4-7 and 4-8). For attitudes towards natural

gas drilling, the Adj. R-squared = .615; while for attitudes towards the Wind Farm, the adj. R-squared = .558. In both cases, the vast majority of this variation is explained by perceived environmental, community, and economic impacts, with beta values that remain largely similar to correlations at the bivariate level. The influence of other variables such as place meanings or place attachment was much lower than when the relationship to attitudes is examined on a bivariate basis (Tables 7 and 8). The models show that resident attitudes towards the wind farm were most strongly related to perceived environmental impacts (beta = .397), meaning that the more negative the environmental impacts were perceived to be, the more negative attitudes were towards the development. Other significant, though weaker, predictors were perceived community impacts (beta = .262; $p < .000$), and economic impacts (beta = .163; $p < .000$). In terms of gas drilling, the model showed that perception of economic impacts (beta = .330; $p < .000$) had largest effect on attitudes towards gas drilling, followed by environmental impacts (beta =.248; $p < .000$),) and community impacts (beta = .273; $p < .000$).

The "personal cost category" of perceived impacts, comprised of variables such as "water quality", "amount of traffic", "noise", etc, did not show a relationship with attitudes toward either gas or wind, even though these types of impacts were reported by respondents to be among the most severe. It appears that residents who are both for and against the development of these energy sources can agree that these impacts are largely negative. Perceived impacts to economic, environmental, and community factors all appear to variously influence resident attitudes towards energy development, but impacts on things like traffic, crime, and noise that make up the personal impact grouping have little influence on levels of support or opposition to these energy sources, likely due to the high levels of agreement with these items, and potentially, a widespread recognition that these impacts were simply a cost of development that are seen as inevitable and acceptable.

Table 4-7: Multiple Regression Analysis with Attitudes Towards Gas Drilling

Independent Variables	Unstandardized Coefficients B	Std. Error	Standardized Coefficients	t	Sig.
(Constant)	-6.980	.530		-13.163	.000
Community Impacts	2.153	.297	.273	7.252	.000
Environmental Impacts	1.623	.233	.248	6.950	.000
Personal Impacts	.287	.230	.037	1.245	.213
Economic Impacts	2.531	.232	.330	10.893	.000
Environmental Place	.043	.234	.005	.183	.855
Community Place	-.157	.190	-.020	-.825	.410
Integration Place	-.341	.146	-.050	-2.336	.020
Threatened Place	-.079	.156	-.012	-.509	.611
Place Attachment	.032	.029	.028	1.108	.268
Residency Status(0 = permanent/1=seasonal)	.105	.308	.007	.341	.733
Length of Ownership	.011	.007	.033	1.505	.133
Acres Owned	1.107E-5	.000	.012	.574	.566
Model Summary: R Square = .621; Adj. R Square = 0.615; St. Error of the Estimate = 3.274					

Table 4-8: Multiple Regression Analysis with Attitudes Towards the Wind Farm

Independent Variables	Unstandardized Coefficients B	Std. Error	Standardized Coefficients	t	Sig.
(Constant)	-11.218	1.399		-8.017	.000
Community Impacts	2.390	.318	.262	7.505	.000
Environmental Impacts	2.749	.254	.397	10.841	.000
Personal Impacts	0.351	.280	.037	1.256	.209
Economic Impacts	1.599	.329	.163	4.860	.000
Environmental Place	0.357	.218	.047	1.632	.102
Community Place	-0.088	.180	-.013	-.489	.624
Integration Place	0.148	.134	.026	1.099	.271
Threatened Place	0.510	.149	.086	3.418	.001
Place Attachment	0.029	.027	.030	1.075	.282
Residency Status (0 = permanent/1=seasonal)	-0.888	.290	-.074	-3.058	.002
Length of Ownership	0.001	.007	.004	.188	.850
Acres Owned	1.225E-5	.000	.011	.500	.616
Model Summary: R Square = 0.565; Adj. R Square = 0.558; St. Error of the Estimate = 2.959					

4-6 Discussion

This research established the perception of specific impacts from energy development as a key driver of overall attitudes towards the energy projects. The relationship between the types of perceived impacts and overall attitudes toward development are similar between wind and gas in that environmental, economic, and community concerns explained a large amount of variation in resident attitudes towards the energy facilities. The strongest relationship was between perceived economic impact and attitudes towards gas drilling. Respondents who perceived a positive impact on such variables as “Area Employment”, “Property Values”, and “Economic Health” were much more likely to have positive attitudes towards gas drilling, corresponding generally with historical and contemporary research that has found economic impacts as perceived as the most positive aspects of natural gas drilling (Stedman et al., 2011; Murdock and Leistritz, 1979).

Meanwhile, some of the impacts of greatest concern (comprising the “personal cost” category, variables such as traffic, crime, noise, and water) seemed to have little effect on resident attitudes towards the gas and wind development. Residents both for and against the energy development seemed to agree that the personal cost category of impacts are largely negative. For example, impacts on water quality, which have been much publicized both locally and nationally in the debate around natural gas drilling, were perceived as among the largest negative impacts from gas drilling, but did not appear to influence attitudes towards development nearly as much as other environmental or economic impacts, suggesting that impacts to water quality were largely beyond debate, and that development could proceed even given the acceptance of these impacts.

The specific types of impact measured here mirror previous literature in some ways (i.e. impacts on scenic beauty from wind energy as paramount; traffic from natural gas drilling as the

largest negative facet) while disclosing new types of impacts typically not documented (i.e. impacts on traffic from wind energy and scenic beauty from gas drilling). The scenic impact of natural gas drilling and the associated infrastructures has been noted by some researchers (Upadhyay and Bu, 2010), and such impacts are often mitigated in western contexts through the use of low-profile equipment and landscaping; however, overall the subject of aesthetic impact from natural gas drilling represents a neglected area of academic inquiry, especially in contexts of multiple energy sources and in regions that are relatively close to population centers.

Environmental impact from energy development on wildlife and landscape change has been expressed by residents in some contexts (Groothuis et al. 2008), and levels of trust in wind energy companies has been measured to effect attitudes towards development in others. (Wustenhagen, et al, 2007; LPI GSC, 2011). The results of this survey generated similar findings in the Armenia Mountain area..

The results of this survey show that respondents view the impacts (both positive and negative)from natural gas drilling to be greater, and that the types of perceived impacts that seem to influence attitudes as more diverse. However, in many ways, landowners in the Armenia Mountain area perceive wind and natural gas development more similarly than differently as it is largely the same types of impacts that residents perceive from both projects. Respondents assessed most of the impacts from natural gas development to be much more negative than the wind farm, and residents' larger attitudes towards the two energy projects reflect this negativity (see Chapter 2). Despite a survey design that clearly separated the questions regarding the two energy sources, part of this result may in part be due to respondent difficulty in delineating impacts from one energy source from another, especially in an area that has seen the rapid, simultaneous growth in development. For example, while it is certain that the development of the wind farm increased traffic in the local area, it is also certain that the amount of traffic related to natural gas drilling is much higher. How survey respondents

delineate the cumulative effect on traffic according to each energy source is not well understood. However, regardless of the methods, these results clearly show traffic as perceived to be among the most adverse impact from both wind farm and natural gas development.

Examined independently, the types of meaning residents see in their community can influence their attitudes towards natural gas development, and to some degree the perception of energy development impacts for both energy sources. Place meanings that are environmental, restorative, or threatened are associated with opposition to natural gas development. These results echo other studies that have examined these types of meanings in other types land use cases (Kaltenborn 1998; Stedman, 2003; Devine-Wright 2009; 2011; Devine-Wright and Howes 2010). However, the place meanings seemed to have little or no association with wind farm development, which conflicts in this instance with studies by Devine-Wright that have looked specifically at the wind farm context.

Interestingly, community-based place meanings (such as friendly, close-knit, welcoming) were positively correlated with natural gas development attitudes, as persons who felt their community exhibited these traits were more likely to support gas development. However, once the impact variables are included in the final model, the effect of place meanings on resident attitudes dissipates.

4-7 Conclusion

In general, the results show that residents perceive many of the same kinds of positive and negative impacts from both wind and natural gas, although they view the magnitude of positive and negative impact to be greater for natural gas drilling. The results also show that certain types of perceived impacts play consistently larger roles than others in influencing overall support or opposition. It is often assumed in the social sciences that an individual's perception of local impacts of a development will influence his or her attitudes towards that

development, and while this assumption is strongly affirmed with results of this research, little research has examined resident impact perception of already constructed facilities. Why certain impacts are more salient in the formation of attitudes than others is promising for future study and can be used to implement more effective impact assessment in the planning and siting of future projects. Is it the case that variables found to not influence resident perceptions in this instance (such as crime, water quality, traffic, etc.) generally do not influence attitudes towards development in other instances of land use change or energy development?

The results imply that the development of these energy sources in close proximity have additive and cumulative effects, at least in the minds of residents, and more comprehensive strategies for managing and mitigating these effects should be considered, and influencing the perception of these impacts can influence resident attitudes towards the development.

There is little evidence, however, that these cumulative aspects are currently being mitigated by environmental managers or the energy companies, at least in the Armenia Mountain context. For example, traffic route planning and mitigation strategies were implemented as part of the planning and siting procedure for the wind farm (AES, 2007), however the wind farm planning document did not consider the cumulative impact of traffic from other sources such as gas drilling. Gas drilling was nascent in the area at the time of the planning document origination (in 2007), however it was well underway at the time of wind farm construction (in 2009).

This survey represents only a snapshot in time, measures perceptions and attitudes of landowners only, and is relatively early in the process of energy development. Natural gas drilling will likely continue in this area for many years, and plans for the construction of another 57 wind turbines have been approved. Research on social impact assessment and the perception of impact has been criticized for lacking a longitudinal perspective, especially in the

case of energy development (Brown, et al. 1989; 2005; Wilkinson et al, 1982; Thompson, 1979) and previous research has shown that perception of impact can change over time. In several cases, the perceptions of positive economic impact were found to be tempered by increased experience with development (Thompson and Blevins, 1983). Likewise, in both wind and natural gas development, perceived negative impacts are also found to be highest at the start of development, and that the amount of negative impact perceived decreases over time (Brown, Dorius, and Krannich, 2005; Devine-Wright, 2005).

While a number of these impacts are inherently subjective (i.e. “scenic beauty”; “pride in the community”, etc.), a number of others can also be measured by objective means (i.e. “amount of crime”) and as these data become available it will be informative for practitioners to compare these resident perceptions with this emergent data.

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CHAPTER 5:

LOCAL CONTROL OVER ENERGY DEVELOPMENT: THE RISE OF "PRIVATE PARTICIPATION" IN THE PLANNING OF ENERGY PROJECTS IN THE RURAL UNITED STATES.

Abstract

Research in the planning and siting of land use changes has emphasized the importance of resident participation in the planning process, especially at the local governmental level. Viewed as an important component of local democratic decision making, increased participation has shown to increase satisfaction amongst residents and may ultimately produce more desirable and effective land use outcomes. Such participation is often viewed as occurring in the public sphere comprised of planning board meetings and other public gatherings (hence the term "public participation"). While local governments have traditionally had wide authority over land use changes, local control over emergent forms of energy development – such as wind farm and unconventional natural gas – are becoming increasingly pre-empted by state agencies. Given such preemptions, fewer opportunities for participation may exist in the public sphere; however, such energy developments afford the prospect of residents "privately participating" in the planning and siting of these energy developments though energy leases on their land. This represents a type of mass-participation in the planning process that occurs outside of the public sphere, or "private participation". This paper provides a review of regulatory structures governing wind farm and natural gas development in the United States, and offers a particular case study in Pennsylvania where both wind and gas were developed largely at the same time and in the same location. A mail survey (n= 1028) of landowners was performed in

the case study area that reveals how contractual status with energy companies influenced perceptions of information access and opportunities for participation.

5-1 Introduction

Public participation in the planning process is considered an important variable influencing resident attitudes towards land use change. Participation can influence community wellbeing and environmental justice, and the magnitude of impacts absorbed by local municipalities (Cowell, et al. 2011; Gross, 2007; Wolsink, 2005, Zoellner et al, 2008). Local decision-making offers direct avenues for participation by interested residents, and planning and siting decisions made at the local level are often seen as preferable to top-down siting decisions made by outside regulators, especially if the local processes are viewed as fair and trustworthy (Fisher, 2002, Munton, 1996; Bloomfield et al. 2001). While some have voiced skepticism over the ultimate effectiveness of local planning and zoning authority (Innes and Booher, 2004; Day, 1997; Petts, 2008), such processes carried out in the public sphere are often conceptualized as prime examples of deliberative democracy (Forester, 1999; Fisher, 1993; Turnhout et al., 2010).

Two of the largest, and most contentious, land use developments occurring in the United States involve energy: the construction of industrial-scale wind farm developments and the development of new so-called “unconventional” natural gas resources. In most of the United States, the ability of local governments to plan for, site, or otherwise regulate natural gas development is largely exempted by state statutes. In contrast, local governments have enjoyed much broader controls over the planning and siting of wind farm developments, however many states have now moved to exempt local authority over planning wind farm developments as well. This growing lack of local authority over energy development provides residents fewer

opportunities for traditional modes of participation in how and where energy facilities are constructed.

Yet, in the case of natural gas and wind developments, hundreds or even thousands of local landowners may enter into private contractual negotiations with the energy companies to develop an energy project. This stands in stark contrast to many traditional forms of energy development or land use change that are controlled by a single landowner. By leasing their land to energy companies, landowners can receive direct financial benefit though lease payments and energy production royalties. Entering into a lease with an energy company can further give the landowner a degree of control over how the development proceeds, and it is becoming more common for landowners to negotiate for construction practices such as preferred environmental safeguards, restrictions to site plan size and locations, landscape remediation techniques, and the use of specific equipment or technology (Jacquet and Stedman, 2011). The results of these landowner negotiations in some cases may be similar to the outcomes of a traditional planning and zoning process. Furthermore, the leasing process represents a mode of "participation" in the planning process of these large-land uses, albeit one that contrasts in important ways with the ideals of "public participation". How these leases are negotiated can vary; some examples exist of collective negotiation (Jacquet and Stedman, 2011; Liss, 2011); however, in many cases such contracts are negotiated privately and are not made publicly accessible.

Little research has investigated the role of lessor-landowners in the process of planning large-scale wind farm or natural gas developments. Participation in planning processes has typically been conceptualized as processes that occur in the "public sphere" (Fisher and Forester, 1993); increasingly, limited local governmental authority has restricted traditional opportunities for residents to participate in the planning and siting of these projects and has this may affect attitudes towards the construction of these projects is not well known.

This paper will offer a brief comparative review of issues related to regulatory authority in the planning and siting of wind and natural gas development in the US; a brief case study of the

Armenia Mountain area of north-central Pennsylvania, where large-scale wind farm and gas field development has occurred in tandem since 2009; and the results of a mail survey conducted in 2011 measuring landowner opportunities for participation and attitudes towards construction of wind and gas developments .

5-1.1 The "public sphere"

It has been noted that modern human activity is increasingly classified as either taking place in the public or private sphere, with the processes of modernization and urbanization viewed as producing a "tendency toward polarization" to either of these extremes (Bahrdt 1977:27; Fisher, 1981). Building from Habermas (1984), Fraiser (1990:57) defines the public sphere as "a theater in modern societies in which political participation is enacted", "the space in which citizens deliberate about their common affairs" and an "institutionalized arena of discursive interaction". The public sphere can comprise interactions on the street (Jacobs, 1961), meeting at a local inn (Bahrdt, 1977), or letters to the editor in the newspaper (Wahl-Jorgenson, 2007).

Habermas (1984) quickly demonstrated that the public sphere is not necessarily synonymous with any form of government, local or otherwise. However, it is the public forums and relative procedural transparency offered by local government decision-making (often generally referred to as "deliberative" or "collaborative planning") that has been noted as a core component of the public sphere and a key institution of modern democracy, (Fisher and Forester, 1993). What constitutes the *private sphere*, meanwhile, has received less academic treatment. A definition is less readily available, although Bahrdt (1977) considers it to include most family life, religious practices, intimate material surroundings and possessions, and close personal relationships.

5-1.2 The importance of Public Participation

The social benefits of public participation in planning processes have been widely noted in the planning and community development fields, and new practices to increase levels of public participation have been instituted widely across various planning contexts (O'Faircheallaigh, 2010; Davies, 2001; Koontz 2005; Rowe and Frewer, 2000).

At the most basic level, public participation is thought to result in preferable siting and construction practices that are tailored to the needs of local residents and municipalities, resulting in lessened land use conflicts and environmental impacts (Duram and Brown, 1999; Heberlein, 1976). However, beyond simply better planning documents, research has shown that participation in local siting procedures can affect the degree to which local residents accept or reject land use changes, especially in the case of large industrial projects (Munton 1996; Boudet and Ortolano 2010). Researchers concerned with procedural justice have described individuals as perhaps more concerned with the process itself then with the outcomes (Lind and Tyler, 1988). The degree to which residents view the siting process to have been just and inclusive will influence their level of trust and acceptance of the constructed facility (Kasperson, et al., 1992; 1988). Gross (2007:2727) notes that complex disputes over environmental planning often include issues of representativeness and the distribution of resources; “these issues are exacerbated when winners and losers within communities are created, frequently resulting in a loss of social wellbeing and damaged relationships.”

Application to renewable energy

Studies of wind farms have shown similar outcomes, with residents who view the process as fair and trustworthy as most likely to accept the development (Wolsink, 2007; 2000; Zoellner, Ittner and Schweizer-Ries, 2005; Walker et al., 2010; Wustenhagen, Wolsink, Burer,

2007; Gross, 2007). Perceptions of procedural fairness are clearly linked with knowledge and experience about the procedural authority in question (Vand den Bos, 2001).

5-1.3 The importance of Local Control as Avenue for Public Participation

In most states in the United States, local counties and municipalities have historically retained control over the use of lands in their jurisdiction (often termed "home rule"), provided that these local laws do not violate state or federal statute (Krane et al., 2001). Accordingly, local participation is thought to be especially important in these contexts. Local government meetings can provide a valuable arena for public discourse, and the ability of communities to guide development at local levels where decisions are made by volunteers who live in the community (such as planning board members) can increase perceived fairness and perceived opportunities for participation (Herian et al., 2012; Schminke, et al., 2000). Yet, it has been noted that despite the benefits of local control, many communities may lack the capacity for effective information distribution or decision making (Kellert, et al., 2000) and success in fostering perceived fairness and participation is far from guaranteed (Koontz, 2005; Williamson and Fung, 2004). For example, many industrial land use projects (such as energy development, the construction of waste facilities, and the siting of transmission lines) benefit society as a whole (i.e., through reduced costs, energy independence), but local communities may bear an "asymmetry of costs" (Munton, 1996:16), often leading to intense local opposition. Such obstacles to industrial siting have resulted in multiple regulatory strategies that offer local governments varying degrees of authority over these decisions. Strategies that override or preempt the local control of these projects have been labeled as the Decide-Announce-Defend (or DAD) strategy, whereby the locations and terms of land use development is decided with little or no public input, suddenly announced to the public, and then defended against criticisms that the decision and the process used to reach it is "an attack on basic democratic principles" (Munton, 1996:2).

5-1.4 Local Regulatory Authority and Energy Development

Oil and natural gas development has occurred across the United States for more than a century, and over time local regulation has largely been preempted by state statute (Laitos, et al., 2004). With the exception of some western states, local municipalities rarely retain the ability to approve or deny natural gas drilling activities. The stated rationales for these policies of preemption typically emphasize ensuring uniform statewide regulation, and ensuring the regulation is designed and enforced by qualified experts available in state agencies. Such preemption, however, can also be a vehicle for overcoming local opposition (Durbin, 2006).

Laitos et al. (2004) noted that the interface between local control and state preemption is continually shaped by ongoing litigation. Recent court cases in New York have allowed towns the ability to ban natural gas drilling as part of a comprehensive zoning regulation, although litigation continues. In Pennsylvania, through litigation in early 2009, towns were also awarded limited abilities to zone for the locations of natural gas drilling operations (Pifer and Wells, 2012). These limited abilities were subsequently revoked via a new state law that instead provides for the ability of municipalities to implement a modest impact fee on natural gas operations.

The phenomenon of wind farm energy has emerged much more recently then oil and gas drilling, and state statutes in most states have not yet moved to preempt local authority. Some observers have remarked that wind siting law in most parts of the US is still in its “wild west” days with current wind law practices akin to oil and gas laws from a century ago (Wetsel and Carmichael, 2009). In many states, local governments can still zone in or zone out wind farm sites, mandate specific practices though the implementation of local ordinances, and require concessions from the wind farm developer in the form of impact fees and mitigation funds (Great Lakes Wind Collaborative, 2010; Salkin, 2010). Such strict local control has resulted in the unsuccessful siting of many wind farm projects and local opposition has limited

overall growth of the wind industry (Evens, et al., 2011). A recent study reported that as many as 45% of wind farm projects have been successfully blocked at the local level (Pociask and Fuhr, Jr., 2011). However, Washington, Oregon, Minnesota, Wisconsin, and New York have fully preempted local authority. New York State placed extensive restrictions on the degree of regulatory authority that local governments have over wind farm siting procedures in order to achieve state-mandated renewable energy standards by overcoming the local barriers to wind farm development (Harkawik, 2011; Blair, 2011).

5-1.5 The Role of Landowners as Private Participants

Unlike the development of other energy sources such as coal or nuclear power, in the case of both wind farms and natural gas development private landowners can play major roles in the planning and siting of these facilities. The leasing process itself, we suggest, provides avenues for wide scale participation in and local controls over the planning process, even if local government authority is exempted.

Both wind and gas energy companies lease the properties where the development occurs. The land is held by hundreds or even thousands of private landowners, and the leases are legal contracts that dictate not only rates of compensation but can include detailed rules for land use planning, access restrictions, and associated industrial activities.

For both forms of energy development, landowner lessors are often hampered by a lack of information compared to that held by the energy company, especially regarding the value of the resource, what constitutes a competitive royalty rate, and the type of leasing terms that can be negotiated. While landowners can—in theory--negotiate for any preferable land use and development practice, unknowledgeable landowners may simply sign the standard lease given to them by the energy company. The process can be characterized as a “seller beware”

transaction, and lessors are advised to obtain experienced legal advice before signing any contract (NYSAG, 2008).

As energy leasing has become more common, landowner knowledge regarding the ability to negotiate has expanded, and information regarding land value and completive leasing terms has become more widespread. Landowners have begun to form coalitions for the purpose of leveraging large amounts of collective acreage for favorable leasing terms from energy companies (Jacquet and Stedman, 2011; Liss, 2011). While such coalitions are most common for natural gas drilling, wind farm coalitions are also known to exist (Wetsel and Carmichael, 2009). In areas where thousands of landowners collectively negotiate for land use controls across large landscapes, the landowner coalition phenomenon offers the prospect for some local control of these energy sources (Jacquet and Stedman, 2011).

However, even if specific development practices are not negotiated—individually or collectively-- the landowner-lessor will likely still have lengthy discussions with energy developer representatives (called “landmen”) at their home when considering the lease offer, where the landmen will likely discuss with the landowner any concerns they may have over the development (McGraw, 2011). If energy development does eventually take place on the property, the energy company is likely to meet with the landowner and attempt to address (or at minimum, discuss) concerns over locations of development and other development practices, even if addressing such concerns is not required under the terms of the lease. Such discussions with energy officials do provide an intimate and private forum for “participation” in the planning and siting of these energy developments, even though the participation occurs outside the public sphere.

5-2 Research Objectives

The importance placed on participation in the planning process, and its associated effects on local support or opposition to planning outcomes, has grown in recent years. Meanwhile, the siting of large energy projects in the US and elsewhere has undergone increased levels of local opposition while offering limited, untraditional methods for participation in the planning process. Therefore, the 3 primary questions driving this research are 1) how do perceptions of information adequacy and opportunities for participation influence overall attitudes towards wind farm or natural gas development?; 2) how do perceptions of information adequacy and opportunity for participation differ between people who have leases with energy companies and those who do not?; and 3) how do these perceptions and their relationships with attitude differ between natural gas and wind development, and how might regulatory structure influence these differences?

5.3 Research Setting

The Armenia Mountain region of northern Pennsylvania offers a comparative example of the planning and siting strategies of the wind and gas industry. Contained within Tioga and Bradford Counties (Fig. 5-1), Armenia Mountain is a highly visible mountain ridge located in the Endless Mountains region of northern Pennsylvania that now contains the Armenia Mountain Wind Farm, a 67 turbine facility operated by international energy firm AES. The area is a diverse mix of small towns, agricultural lands, and amenity-rich natural areas, with a year-round population of about 10,000 people within 16km of the wind farm, including 6 small towns or boroughs (U.S. Census Bureau, 2011). The mountain and surrounding area has also been home to intensive development of the Marcellus Shale natural gas reserve since 2009, with 934 shale gas wells drilled between January 2009 and September 2011 within the above described region. Of these, 96 were drilled on or adjacent to private parcels that also contain wind turbines (PA DEP, 2011).

The wind farm facility was formally proposed in 2007 and constructed in 2009-2010, consisting of 67 1.5 MW wind turbines with an average height of 118m, along with several substations, over-ground and under-ground transmission lines, metrological towers, and approximately 25km of access roads. Approximately 10,000 acres, the 117 private parcels under lease by AES contain a patchwork of primarily forested areas intermixed with hay fields and pastures (AES, 2007). AES additionally gained approval for the construction of a second phase of development – consisting of an additional 56 turbines – but company officials have recently stated that Phase II is currently on hold during the economic recession.

5-3.1 Study Area Regulations and Siting Authority

Like many states, the commonwealth of Pennsylvania preempts local authority over the siting of oil and gas drilling though the Pennsylvania Oil and Gas Act (58 P.S. § 601.602) and the Pennsylvania Department of Environmental Protection (DEP) has sole control over the issuance of drilling permits in the commonwealth. The Oil and Gas act provides only that a 24-hour notice that must be given to the local political subdivision before drilling can commence (58 P.S. § 601.201).

In contrast to natural gas regulation, Pennsylvania has no specific law regarding the regulation of wind farms, leaving the regulation to local authorities (Great Lakes Wind Collaborative, 2010). In 2007, the state did draft a suggested “model ordinance” for local governments to adopt to guide them in the planning and siting of wind farms, although such ordinances are voluntary, and model ordinance was produced too late to influence development of Armenia Mountain.

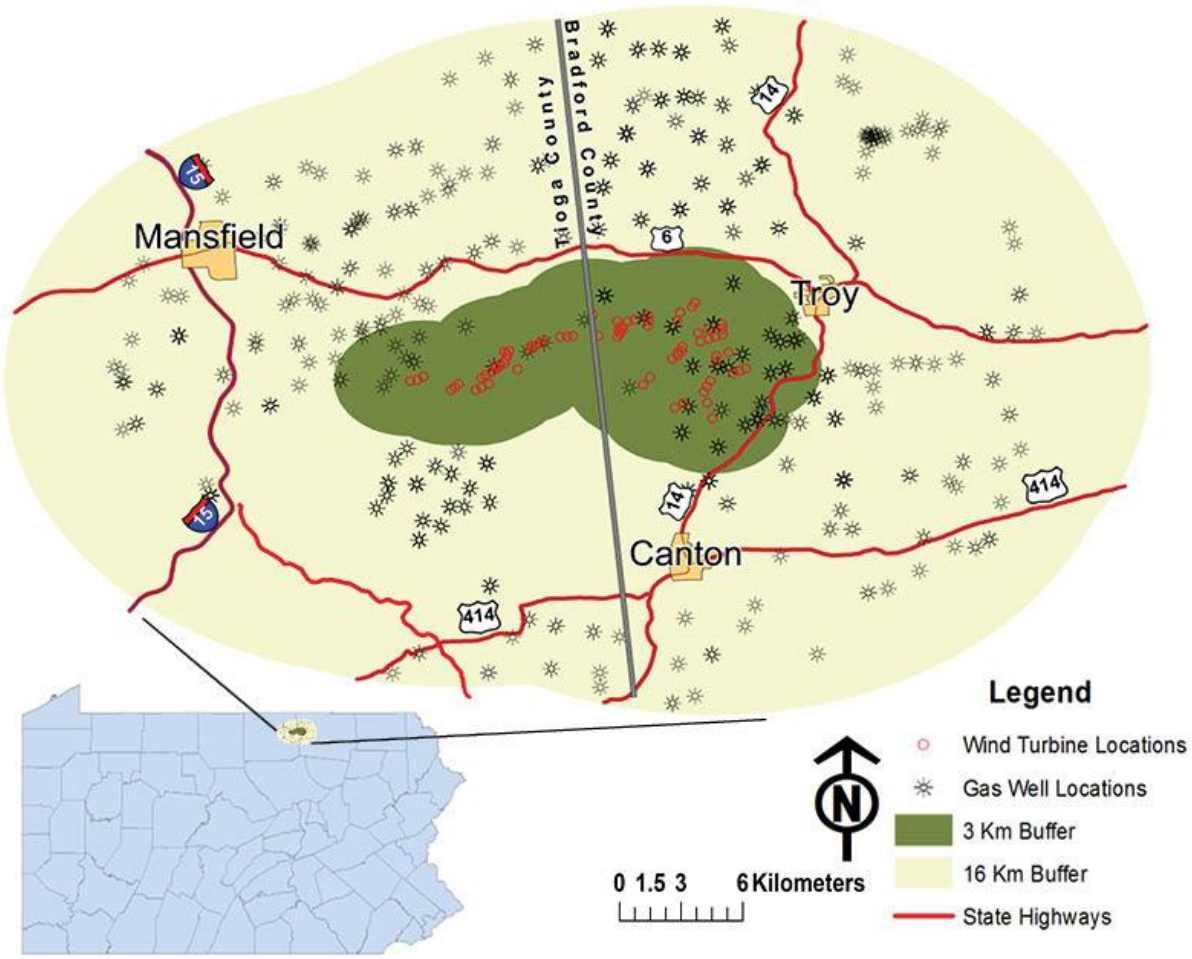

Figure 5-1: Depiction of the study area. The state of Pennsylvania is shown in inset. Note: In many instances, due to wells drilled in close proximity, Gas Well Location symbols closely overlap each other.

5-3.2 Wind and Gas Development

Having leased with individual landowners for several years, in early 2007, AES officials approached county planning officials in Tioga and Bradford counties with the intent to submit a land use application for a wind farm on Armenia Mountain. Tioga County had no ordinance regarding the construction of wind farms, while Bradford County passed an ordinance in 2004

designed for cell phone towers that contained a provision that in the case of a “wind park” lots and buildings must be set back from a tower the distance equal to 1.25 times its height (Bradford County Planning Commission, 2004). Both counties additionally had requirements in place for all land use developments, such as storm water runoff provisions. The planning process consisted of two public meetings of each of the two planning boards, for a total of four public meetings. Planners recalled that attendance for these meeting was relatively modest, although two opposition groups did form called “The Tioga Preservation Group” and “Save God’s Country” which protested the meetings (Clarke, 2007). Wind Farm officials also attended public meetings for the townships of Ward and Sullivan in Tioga County, and Armenia Township in Bradford County. These townships have not instituted land use or zoning controls, so regulation over land use changes reverts to the county. During the planning process, the counties made few requests to the wind farm developer. Bradford County did not request any modifications to the wind farm application brought by AES, while Tioga County did request the setbacks of turbines from houses to be increased slightly from approximately 1,500ft to 18,00ft, to which the developer complied. AES offered a “community host agreement” to the counties; however the counties did not choose to enter into an agreement. Operating agreements were put in place with the townships, which includes an annual payment to each township of $2,500 per megawatt of electricity generated in the township (minus the amount of property taxes paid), primarily intended to offset costs to the townships for road repair and maintenance (AES, 2007).

An opponent of the wind farm sued Tioga County on the grounds that it was illegal for the county to waive the normally required visual mitigations; however the Commonwealth Court of Pennsylvania ultimately ruled in favor of the county (Commonwealth Court of Pennsylvania, 2009).

Local government regulatory authority, and correspondingly, opportunities for public participation in the planning processes, differed sharply between the wind farm (nearly complete

local control, many public meetings) and gas drilling (nearly zero control and no public meetings). Such differences in opportunities for participation may play a role in resident attitudes towards development.

5-4 Data and Measures

A questionnaire designed to measure landowner attitudes towards wind and natural gas development occurring in the Armenia Mountain Area was administered in 2011. Four questions were asked for each energy source that asked respondents to rank, on a 5 point scale, how positive or negative they felt towards the current development, towards the future development, how their attitudes changed during the development and how the development changed their attitudes towards the use of the energy source in general (Table 5-3).

The survey also contained questions that measured resident levels of participation in the public planning and siting processes for both gas and wind development, as well as questions that measured whether the landowner has leased their land to a wind and/or gas company or has hosted wind or gas development on their property, and questions that measured respondent's perceptions of the amount of information they received about the planning and siting process for both wind and gas and the amount of participation opportunities they believed they were given in the planning and siting process for wind and gas development.

5-4.1 Survey sample

Publically available property tax databases and ArcGIS software were used to obtain geo-spatial information, usage characteristics, and landowner mailing information for all parcels within a 16km region around the Armenia Mountain Wind farm in Tioga and Bradford counties. All commercial, industrial, and publically-owned parcels were removed from the sample. After duplicate landowner names and mailing addresses were removed, approximately 8,000 property owners owning parcels classified as residential, agricultural, and recreational were

identified, from which a survey sample of 1,800 property owners was selected. To avoid a low response among landowners at or near the wind farm, all 570 landowners who owned property within approximately 3km of a wind turbine were selected as part of the survey sample, while an additional 1,230 property owners were randomly selected from the remaining landowners within the larger 16km region. Latitude and longitude coordinates were obtained for all wind turbines and gas wells, and resident distance or proximity was measured from these coordinates to the geographical center of the land parcel.

The survey was administered in April and May of 2011, utilizing a series of two mailing each followed by a reminder letter (Dillman, 1978). 49 of the 1,800 surveys were reported as undeliverable; of the remaining 1,751 surveys, 1,028 were returned, achieving a response rate of 58.7%. In the end, those within 3km of the wind farm had a higher response rate (359 responses, or 63.0% returned) compared to those beyond (669 responses, or 54.4% returned). Therefore the results of the survey as a whole have been weighted to control for the oversampling of respondents close to the wind farm.

5-6 Results

5-6.1 Participation and perceived participation

Over 75% of respondents indicated they felt they were given very little or no opportunity to participate the planning and siting process for wind development, with over 60% of respondents indicating the same with regards to natural gas drilling (*Table 5-1*). On the surface, these figures are somewhat ironic, given that there is essentially no public review or planning process for natural gas drilling and a full, public review process at the local level for the wind farm. While informational meetings held by entities such as cooperative extension, state agencies, local businesses, and local governments may have fostered a perception of opportunity for participation (and nearly 20% of respondents indicated they attended at least

one of these meetings for gas or wind), the vast majority of respondents indicated they have not participated in any aspect of the public planning and siting process for wind or natural gas (*Table5- 2*).

5-6.2 Perceived Information

Over 75% of respondents indicated they were either uninformed or very uninformed about the wind farm, with 31% of respondents indicating they received no information at all regarding its construction (*Tables 5-1, 5-2*). Parallel to the findings about participation, respondents felt somewhat more informed regarding natural gas drilling, with only 44% indicating they felt uninformed or very uninformed, and 11% indicating they received no information (*Tables 5-1 and 5-2*). Respondents identified the majority of information coming from newspaper sources and word of mouth, generally corresponding with extensive newspaper and media coverage on Marcellus Shale natural gas drilling.

5-6.3 Attitudes and experience regarding energy development

Respondents were relatively evenly divided (and moderate) in their attitudes toward construction of the wind farm (with nearly 40% reporting that it made the area “neither better nor worse off”). In contrast, attitudes towards natural gas drilling were more polarized and negative in nature (with over 30% of respondents indicating that the gas drilling made the area “much worse off”, 21% indicating “better off”, and only 18% of respondents choosing “neither worse nor better off”) (table 3). These attitudinal Likert scale items (on a scale from 1 to 5, with 1 = “much worse off”, and 5 equaling “much better off”) were compiled into a summative scale used to represent overall resident attitudes towards the development (Table 5-3).

Respondents were asked if they had a lease with a wind company or gas company, and if they had a wind turbine or gas well (i.e. development) on their property, and then categorized into three categories: no lease or development, lease only, or lease and development. 27

respondents indicated they had a wind lease, and an additional 21 respondents had a wind turbine on their property, and 41 did not answer the question. 515 respondents indicated they had a gas lease, and an additional 90 respondents had at least one gas well on their property, while 65 respondents did not answer the question.

Landowner experience with leasing property or having energy development occur on their land was showed a positive relationship with positive attitudes towards natural gas development. Dummy variables for these groups were assigned, and bivariate regression analysis shows landowners who have natural gas leases (r_s = .171, p<.01) or gas development (r_s = .188, p<.01) on their property are more likely to express that natural gas drilling made the area better off than those who do not have leases or development. Respondents with wind energy leases appeared to show a similar relationship although it was not statistically significant (for more detailed analysis of these results, see Chapter 2).

5-6.4 Leasing and energy development experience and attitudes towards development

Respondents with a lease, and those with natural gas well on their property are much more likely to feel informed about the planning and siting process, with over 47% of respondents with a well on their property indicating they were informed or very informed compared to about 25% of those with no lease or well. In the case of the wind farm, the differences were even more dramatic, with 3% of landowners without a lease or turbine indicating they were very informed, compared to over 35% of those with a turbine. Moreover, those with a lease or a development are more likely to perceive opportunity for participation in the planning and siting process, with over 40% indicating they had enough or more than enough opportunity while only 11% of those without a lease or a well indicating the same (*Tables 5-4 and 5-5*). The relationship is similar, although not as strong, for wind farm development experience and feeling informed and opportunity to participate (*Tables 4-5 and 5-5*).

Table 5-1: Respondent perceptions of levels of opportunity and information.

How informed do you feel about the [the energy development]?					Do you feel like you have been given enough opportunities to participate in the planning and permitting process for [the energy development]?				
	Wind Farm		Gas Drilling			Wind Farm		Gas Drilling	
	Frequency	Percent	Frequency	Percent		Frequency	Percent	Frequency	Percent
Very Uninformed	502	44.1%	281	24.6%	None	717	63.0%	483	42.4%
Uninformed	270	23.7%	228	20.0%	Little	141	12.3%	229	20.1%
Neither	230	20.2%	280	24.6%	Neither	165	14.5%	238	20.9%
Informed	89	7.8%	246	21.6%	Enough	60	5.2%	129	11.3%
Very Informed	47	4.1%	127	11.1%	More than Enough	42	3.6%	79	6.9%

Table 5-2: Information sources and types of participation reported by survey respondents (can check more than one).

	Wind Farm		Gas Drilling			Wind Farm		Gas Drilling	
Information sources	Frequency	Percent	Frequency	Percent	Types of Participation	Frequency	Percent	Frequency	Percent
Word of Mouth	542	47.3%	509	45.5%	Public Meetings	57	5%	221	19.8%
Newspaper	386	33.7%	568	50.9%	Rallies/Events	5	0.5%	17	1.5%
Public Meetings	51	4.4%	180	16.1%	Letters to Newspaper	0	0%	15	1.4%
Notices in Mail	33	2.9%	146	13.1%	Donated to Groups	4	0.3%	10	0.9%
Websites	51	4.4%	161	14.4%	Signed Petitions	13	1.1%	41	3.7%
Energy Developer	59	5.1%	198	17.7%	Letters to Govt. Agencies	4	0.4%	24	2.1%
Government Officials	11	0.9%	36	3.2%	Other	15	1.3%	30	2.7%
Other	91	8%	70	6.2%	Not Active in Process	1033	90.3%	831	74.5%
Received No Information	372	31.6%	121	10.9%					

Table 5-3: Scales of Resident Attitude Towards Energy Development

	Mean		Std. Dev.		Cronbach's Alpha	
	Wind Farm	Gas Drilling	Wind Farm	Gas Drilling	Wind Farm	Gas Drilling
Attitude Scale	3.10	2.77	1.123	1.327	.917	.939
Attitude Towards Existing Development	3.01	2.78	1.161	1.384		
Attitude Towards Additional Development	2.93	2.79	1.262	1.431		
Effect on View of Energy Source in General	3.33	2.89	1.306	1.480		
How Attitudes Towards Development Changed	3.17	2.66	1.285	1.471		

Possible Answers: 1 = Very Negative; 2 = Negative; 3 = Neither Negative nor Positive; 4 = Positive; 5 = Very Positive

Table 5-4: How informed do you feel about the planning and siting process for [the energy source]?

	Very Uninformed		Uninformed		Neither		Informed		Very Informed	
No Lease or Well	119	28.8%	94	22.7%	96	23.2%	65	15.7%	40	9.7%
Lease	137	28.6%	110	24.6%	145	24.6%	136	23.1%	62	10.5%
Well	11	11.2%	13	13.3%	27	27.6%	31	31.6%	16	16.3%
Total	292	24.2%	217	19.7%	268	24.3%	232	21.1%	118	10.7%

Pearson Chi-Square = 34.295; df = 12; p < .000

	Very Uninformed		Uninformed		Neither		Informed		Very Informed	
No Lease or Turbine	495	45.0%	265	24.1%	221	20.1%	82	7.5%	37	3.4%
Lease	4	21.1%	3	21.1%	4	21.1%	3	15.8%	5	26.4%
Turbine	1	7.1%	2	14.3%	2	14.3%	4	28.6%	5	35.7%
Total	500	44.2%	270	23.8%	227	20.0%	89	7.9%	47	4.2%

Pearson Chi-Square = 99.283; df = 12; p < .000

Table 5-5: Do You feel like you have been given enough opportunity to participate in the planning and siting process for [the energy source]?

	No Opportunity		Little Opportunity		Neither		Opportunity		More than Enough Opportunity	
No Lease or Well	215	52.6%	84	20.5%	71	17.4%	26	6.4%	13	3.1%
Lease	219	37.2%	122	20.7%	131	22.2%	71	12.0%	47	8.0%
Well	23	23.4%	14	14.3%	20	20.4%	28	28.6%	13	13.2%
Total	457	41.7%	220	20.1%	222	20.2%	125	11.4%	73	6.7%

Pearson Chi-Square = 88.338; df = 12; p < .000

	No Opportunity		Little Opportunity		Neither		Opportunity		More than Enough Opportunity	
No Lease or Turbine	698	64.0%	135	0.0%	159	0.0%	56	0.0%	38	3.5%
Lease	9	47.4%	2	0.2%	3	0.2%	3	0.1%	2	10.5%
Turbine	5	35.7%	3	0.2%	1	0.2%	1	0.2%	4	28.6%
Total	712	63.6%	140	0.1%	163	0.1%	60	0.3%	44	4.0%

Pearson Chi-Square = 34.702; df = 12; p < .001

Multiple Regression Models

Multiple regression models that use level of participation, how informed the respondent feels, and perceived opportunity for participation as independent variables to explain attitudes towards energy development for both wind and natural gas development (tables 5-6 and 5-7) were developed.

In the case of natural gas development, both how informed the respondent feels (beta = .382; p<.000) and the perceived opportunity for participation (beta = .209, p<.000) explained a good degree of variation in resident attitudes towards development. These variables showed more effect than did the effect of leasing with a gas company (beta = .202; p<000) or development on their property (beta = .195; p<000). The types of activities in which

respondents indicated they participated were added to derive a crude composite measure of participation activity, and this measure of participation activity showed a slight negative effect (beta = -.085, p = .001) on attitudes towards natural gas drilling, signifying that greater participation was associated with less support. The overall model explained a fairly strong amount of variation in resident attitudes (Adj. R-squared = .351), as persons who felt more informed and perceived more opportunity to participate are more likely to support natural gas development (*Table 5-6*).

In the case of the wind farm development, both how informed the respondent feels (beta = .150, p< .000) and the perceived opportunity for participation (beta = .138, p<.000) also showed a positive relationship with attitudes towards the wind development, an effect much larger than the effect from leasing and development on the property, although the overall amount of variation explained by the model was negligible (Adj. R-squared = .053) (*Table 5-7*).

Table 5-6: Multiple Regression Analysis with Attitudes Towards Gas Drilling

Independent Variable	Unstandardized Coefficient	Std. Error	Standardized Coefficient	t	Sig.
(Constant)	4.177	.337		13.386	.000
Level of Participation	-.586	.168	-.085	-3.378	.001
Feel Informed	.824	.109	.209	7.526	.000
Opportunity for Participation	1.528	.111	.382	13.729	.000
Gas Lease (dummy)	2.146	.279	.202	7.683	.000
Gas Well (dummy)	3.597	.498	.195	7.228	.000

Model Summary: R = .595; R Square = .354; Adj. R Square = .351; St. Error of the Estimate = 4.26299

Table 5-7: Multiple Regression with Attitudes Towards Wind Farm

Independent Variable	Unstandardized Coefficient	Std. Error	Standardized Coefficient	t	Sig.
(Constant)	10.461	.285		36.741	.000
Level of Participation	-.688	.359	-.059	-1.915	.056
Feel Informed	.569	.128	.150	4.464	.000
Opportunity for Participation	.519	.123	.138	4.208	.000
Wind Lease (dummy)	-.570	1.037	-.016	-.550	.582
Wind Turbine (dummy)	-1.629	1.240	-.041	-1.314	.189

Model Summary: R = .240; R Square = .058; Adj. R Square = .053.; St. Error of the Estimate = 4.37136

5-7 Discussion

Opportunities for participation in energy development differ between wind farms and natural gas. The results support previous research that indicates that perceived knowledge and opportunities for participation in the planning and siting process foster positive attitudes towards land use change. However, the type of participation in the planning and siting of the energy developments detailed in this study differs dramatically from that of previous research. Rather than involvement in public, government-led planning processes at the federal, state, or local level, a significant portion of landowners in the Armenia Mountain context are participating via individually—or at times, collectively-- negotiating contracts with energy companies that dictate the terms of the energy development for their private property. Our data reveal that persons who enter into these contracts for either gas or wind are significantly more likely to feel informed, and feel as though they had an opportunity to participate in the process, and are more likely to support the energy development as a whole.

5-7.1 Rise of “Private Participation”

Conventional wisdom around natural gas development in the Marcellus Shale typically explains high levels of support for gas development among leasing landowners as a function of their receiving financial compensation. Our results suggest another possibility: such landowners also feel as though they received more information and more opportunities to participate, factors that have been shown to improve levels of support in other planning and siting contexts.

This type of “private participation” is apparently useful for those in a position to engage in it (i.e., landowners who have been targeted for energy development), however the process can certainly disenfranchise many people, especially those who do not own land (and are thus immediately disqualified from this type of participation). In addition to disenfranchisement, other ideals of deliberative democracy, such as the free flow of information and exchange of ideas among interested parties, will be significantly subverted by these processes as well. Other benefits of planning and the local government level may also be lost, especially in cases of regional planning that takes into account regional factors and provides uniformity of regulations across large areas of land.

It is possible, however, that regional planning and spillover benefits may still more broadly accrue: Jacquet and Stedman (2011) explore these realms of community representativeness and community benefits in the context of lessor-landowners acting collectively in the form of natural gas landowner coalitions. Additionally, while not as common as natural gas coalitions, wind farm landowner coalitions are also known to exist in Texas and other places. Such collective negotiations help to move the participation process closer to that akin to the public sphere, with landowner coalition members debating land planning procedures and strategy in public meetings and newsletters.

However in the case of Armenia Mountain (as is the case in many other areas of the US), such landowner organizations did not form, and most landowners entered into agreements with energy firms on an individual level with land planning negotiations taking place in private, often inside the landowner's home. As local governmental controls over energy development become increasingly preempted by state regulators, traditional public forums for participation may become less available, and the land-leasing structure of the wind and natural gas industries may push participation into these untraditional avenues.

The case of Armenia Mountain also illuminates the complexity that comes with local control over land use, especially in rural areas. In this context, while local governments had relative complete regulatory authority over the planning and siting of wind developments, the governments had little capacity or experience to act on this authority or translate it into benefits at the community level. Local governments in rural areas are traditionally plagued by limited fiscal and human resources and a lack of desire and/or capacity to effectively use their land use controls, problems which have been noted as far back as at least the 1930s (Hein, 1960; Flora, et al. 1992.

Local public participation has long been considered an important variable in the effective and successful in land use siting decisions, as public participation is seen to foster increased levels of trust, perception of fairness and procedural justice, and positive attitudes towards the eventual outcome. The Armenia Mountain example discussed here largely echoes these findings in the realm of energy development, but offers a new avenue for participation not previously discussed in the planning literatures, that being wide-scale individual-level participation in the process via contractual negotiations. Such participation holds some promise in a context of limited local governmental control, but importantly lacks the representativeness of public participation and traditional land use planning.

5-8 Conclusions

This article provides survey data on the relationship between perceptions of information and participation opportunity and attitudes of landowners in a region of North-Central Pennsylvania that has undergone both wind and natural gas development. The results show that persons who had entered in contracts with energy firms to lease their land for gas drilling or wind turbine construction perceived more information, more opportunities for participation in the planning and siting process, and held more favorable perceptions of the energy industry. More research is needed to discover why exactly these leasor-landowners perceive greater levels participation and information, and if these perceptions are empirically related to financial compensation, personal experience with energy operators, or other factors.

The survey is primarily limited in that it does not measure the perceptions of non-landowners, and does not capture how attitudes and perceptions of the planning process changed over time. Additionally, the results of the survey would have been more informative if respondents were asked also asked directly about their perceptions of fairness or procedural justice, about their preferred role of local government in the regulation of these energy sources, or more specific questions about levels of compensation.

Spatial and temporal overlap in the construction of wind and natural gas facilities has historically been something of a rare occurrence; however the potential growth of these industries coupled with their large footprints suggests that it will be more commonplace in the near future. Additionally, other energy sources such as biofuels, solar, and carbon sequestration technologies are also posed to expand.

Most crucially, research on participation in planning and siting processes has been limited to what is typically considered “the public sphere”, and the role of lessor-landowners in the planning and siting of large, landscape sized energy development has not been well

examined. Emerging forms of energy development that depend on leases with private landowners, coupled with increasingly limited local governmental controls, has created avenues for planning and siting participation external to public life. Such private participation offers an important and direct opportunity for large segments of the population to directly engage and control important land use decisions, however other segments of the population become disenfranchised and the benefits of public deliberation are not realized. Such private participants in these processes have important implications for energy policy and planning, community development, and the role of deliberative democracy in large land use decisions.

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CHAPTER 6:

CONCLUSION

Comprised of four research articles, this dissertation examines natural gas drilling and wind farm construction using a research site and methodology that allows for easy comparisons between the two energy sources. Three of the articles in this dissertation are based upon the results of a landowner mail survey that was administered in the Armenia Mountain region of north central Pennsylvania in 2011, and the fourth article is a review article that advanced a theoretical understanding of how residents interpret such changes.

The regulatory environment, local planning and siting regimes, land use and spatial characteristics, resident perceptions of impact, place meanings and identity, resident attitudes for or against, and resident contractual engagement with the two energy industries were all facets explored in this dissertation. The overall findings, the conclusions, the contributions to the field, and the limitations of this work are each multidisciplinary and complex.

Overall, the findings of this work paint wind farm and natural gas development as similar. Both are conceptualized as land use development and technological change, and resident perceptions of these developments appear to be largely congruent. Chapter 2 shows that leasing status, proximity to the development, and environmental attitudes all show a similar (although not identical) relationship with both gas and wind development, even though overall attitudes are more negative for gas drilling. Chapter 3 shows – using examples from both gas and wind, as well as other types of land use and environmental change – that land use change in general can potentially impact the social-psychological fabric of communities, affecting different types of residents in different ways. It is an area of inquiry largely thus far neglected by researchers. Chapter 4 shows that the impacts perceived by residents from wind and gas are

also largely similar (although with a few notable differences in type and magnitude of impact). Factors such as community attachment, residency status, and sociodemographic status all seem to affect gas and wind in a similar fashion. Chapter 5 discusses the regulatory structure of gas and wind developments which can be remarkably different in many states, but yet have very similar practices of leasing property from landowners and paying royalties for energy produced. The article suggests that these leasing practices seem to affect landowner attitudes towards information availability and participation to a great extent, while the local regulatory structure appears to have little influence.

6-1 Summary of findings:

The chapters contained herein did not frame the research agenda as testing a set of specific hypotheses, however, hypotheses were devised in both the design of the research and discussed in the introduction chapter of this document. Taken as a whole, the findings of this research can answer the research questions poised at the beginning of this document. As discussed at the outset, this research is concerned with several suites of questions, many of them inter-related, ranging from the comparison of impacts from gas and wind development, to questions more theoretical in nature.

6-1.1 Discussion of the Results

Question Suite 1:

What are the impacts that residents perceive from wind and natural gas development? Are these impacts, social, economic, environmental in nature? Which of these impacts are seen to be positive and which are seen as negative? Do the impacts or level of positive/negative-ness differ for wind and natural gas? Are these impacts cumulative in nature among gas and wind?

The results from this work show that the residents largely do see economic impacts from gas drilling and wind farms as positive, while social and environmental impacts are seen as

negative. Residents did view economic impacts from gas drilling as more positive than the wind farm, and environmental impacts as more negative; however, in general, the types and categories of impacts were similar for both gas and wind, suggesting a cumulative nature (across environmental, social, and economic domains) in the types of impacts experienced by residents from the simultaneous development of gas and wind facilities. The magnitude of impacts (both positive and negative) was found to be more extreme from gas drilling and this in part likely reflects the fact that the overall level of development activity in the area has been greater for natural gas development.

The results show that impact perception, especially impacts stemming from differing projects in the same location, is complex and difficult to paint with a broad brush. For example, a large portion of the debate around gas drilling has revolved around impacts to water quality, and the results show that residents in the Armenia Mountain area perceive the impact to water as being among the most negative. However (as is discussed below), the effect of this impact perception on residents' overall attitudes towards development is much less clear. Likewise, the debate over wind farm development is often predicated over aesthetics and impacts to scenic beauty and the results show that, indeed, residents perceive scenic beauty to be among the things most negatively impacted by development. However, in addition to water quality, residents also perceived scenic beauty as among the biggest negative impacts from gas drilling.

Question Suite 2:

What factors influence the impacts that local residents perceive? What factors influence how the resident views an energy development positively or negatively? For example, do residents' perceptions of local aesthetic quality, and the role that aesthetic quality plays in their sense of place, influence the level of perceived aesthetic impact from energy development? Can royalties be viewed as positive even if the resident does not receive them? The obvious follow-

up questions are "how and why?": What are the siting and construction actions and protocols taken by wind and gas developers (either voluntarily or by law), and how do they effect the perception of impacts?

The hypothesis that proximity was a key factor that influences perception of aesthetic and environmental impact was found to be false overall. Proximity to the wind farm was shown to have a slight negative relationship between attitudes towards the wind farm (i.e. the further away, the more positive the attitude), while attitudes towards gas drilling showed no relationship with proximity.

Environmentalism played a much bigger role – residents who agreed with environmentally-based place identities and with higher scores on the New Environmental Paradigm scale did perceive a greater environmental impact from energy development, and were more likely to hold negative attitudes towards energy development overall. The effects of environmental attitudes and environmentally-based place identities were present in both wind and gas development, although the relationship was much stronger for the latter. While the relationship between environmentally minded respondents and their attitudes towards gas drilling is not surprising, it was conceivable that environmentalists could have held a stronger affinity for wind energy given its "green image" as low-carbon source of energy. However, the results here showed that environmentalists were more likely to harbor negative attitudes towards both extant and future wind farm development.

The hypothesis that residents with a strong place attachment will perceive greater negative aesthetic and social impacts was not supported. Place attachment appeared to have no relationship with attitudes towards development or aesthetic and social impacts, despite a number of previous studies that have found such relationships. The reasons for this non-finding are potentially numerous, such as a relative lack of diversity in attachment levels as compared

to other studies, or that (perhaps unlike other studies) the salience of this particular issue is so great and attitudes so diverse that attachment plays a smaller role than compared to other issues. For example, strongly-attached landowners who have leases with energy companies are competing with strongly-attached environmentalists who do not such leases and score high on the New Environmental Paradigm Scale. Exploring these more nuanced relationships in this data and future research projects is fertile ground for new research endeavors.

Question Suite 3:

How does the perception of specific impacts influence the overall level of support or opposition to the project? For example, are people that perceive negative environmental impacts more likely to oppose the development that people perceive negative social impacts? What about positive impacts?

The perception of specific impacts was found to wield a great amount of influence on overall attitudes towards development. In particular, residents who perceive greater positive economic impacts were much more likely to support the development, and those who perceive negative environmental impacts were much more likely to oppose the development.

Closely related to perceived impact on the environment were environmental attitudes overall, which were found to have a strong negative relationship with attitudes towards both wind and especially gas development. In fact, environmental attitudes, environmental place meanings, and perceived environmental impacts were all closely related to overall attitudes towards development, while other categories such economic impacts/meanings were not as related.

For example, community place meanings (i.e. “this is a close knit community”) actually showed a positive relationship with attitudes towards gas development and lessened perceived impacts to these areas. Interestingly, some of the impacts perceived to be most negatively

impacted by development (i.e. water, traffic, human health, etc) were the least likely to affect resident attitudes toward development, suggesting that residents both for and against development agree that these types of impacts were negatively affected, and that it is other types of impacts (such as economic or environmental factors) that influence attitudes overall.

Question Suite 4:

How can the implementation of future energy developments be designed to lessen the perception of negative impacts, and improve the perception of positive impacts? Are there specific actions or protocols that are taken or could be taken by energy developers to mitigate the perception of adverse impacts?

Resident perceptions of the siting and regulation of the development was strongly related to overall levels of support, suggesting that better siting and planning protocols that harbor feelings of trust, justice, and inclusiveness can influence positive attitudes in this case. These findings are similar to many other planning and siting contexts, however energy developments such as wind and gas offer peculiar circumstances for increasing participation and knowledge in the planning processes, principally though the leasing process.

Better regulation of the leasing process, particularly at the local level, would be one way to move the process into the public sphere. Municipalities routinely regulate the terms of other such contracts (such as apartment leases), and public debate at the local level on what types of leasing terms and practices should be mandatory is one way to increase participation in the process to members of society beyond those who own land available for natural gas leasing.

Another option in this realm is the utilization of natural gas coalitions that use the leverage afforded from pooling their land resources to collectively negotiate with energy companies for favorable leasing terms. (See Appendix B for further discussion of this phenomenon). Many such coalitions meet in public, debate, and elect representatives in

manners similar to those in public meetings, and such actions certainly move the process more into the public sphere, although non-members do not receive any direct benefits. For these coalitions to, at minimum, seek the input of non-members would broaden the sphere of participation in these negotiations.

Co-siting Disparate Energy Industries

As has been noted in previous chapters, the wind and gas industries share a number of important characteristics, especially in terms of land use and site construction. Great opportunities exist for the co-sting of these facilities to minimize adverse impacts such as land use disturbance, disturbance to neighboring properties, levels of traffic, or municipal pressures related to the surge in workforces. Yet, these energy industries are regulated by an amalgam of differing state and local jurisdictions, and the industries themselves are almost completely separate. In the context of Armenia Mountain, little-to-no coordination has occurred between the energy company constructing the wind farm and energy companies developing the natural gas wells. In fact, the wind farm company has sought legal recourse against a natural gas company for their use of wind farm access roads, use that delayed the final environmental permitting for the roads.

6-2 Contributions to the field

As a multidisciplinary work, this dissertation contributes at various levels to a number of fields, including rural and environmental sociology, land use planning, social psychology, energy policy, and risk analysis. An important contribution to all of these fields is the recognition and serious consideration of wind and natural gas energies as both one part of a larger phenomenon. In almost every case, in all of the fields listed above, wind and natural gas are treated as completely separate industries, each with different effects on environmental, social, and economic factors, as well as the different ways that local residents react to and interpret

development in their areas. This work shows that these energy sources can be studied together, and the locations where wind and gas are sited in close proximity is and will continue to be increasing rapidly. Multiple locations exist in Pennsylvania, Texas, Colorado, and Wyoming where natural gas and wind energy is currently located over each other, with additional locations in the planning stages. Research that examines these energy landscapes, regardless of the discipline, will hopefully be aided by the work contained in this dissertation.

6-2.1 Risk Analysis and Social Psychology

The theoretically-based review chapter contained herein contains a framework to advance the important concept of the "social fabric at risk" that was first introduced by Short Jr. (1984) nearly 30 years ago and since largely forgotten. The framework joins the largely social-psychological attributes of place- and community-based identity with the evaluative tools of risk analysis to show that residents may assess the risks of disruptions to community and place in a similar fashion that they assess other types of risk such as environmental catastrophe and environmental harm. As reviewed in the chapter, many different academic fields have each described various aspects of risk to social and psychological variables, however a comprehensive treatment that combines these relatively obscure descriptions has not been provided. The chapter further contributes to the diverse field of risk analysis by providing a method to measure such risks.

6-2.2 Planning

Within the discipline of planning and land use management, this work contributes to the information available on how these energy sources are each regulated at the state and local level, and provides some description of how these regulations interact (or fail to interact) in at least one site in Pennsylvania. Additionally, and importantly, a contribution is made to the conceptualization of what constitutes "participation" in the local planning process. Public

participation in the process of siting of facilities is considered a paramount goal in the field of land use planning, and yet this dissertation shows that tens or even hundreds of thousands of local residents can participate—albeit individually--in the planning and siting process, influencing entire landscapes with their participation, without there ever being a public meeting or even local regulatory control. While sometimes occurring collectively, such participation often occurs on an individual-by-individual basis, occurring in living rooms or at kitchen tables, on a one-on-one basis between landowners and energy officials. It is participation in the planning and siting process that occurs out of public view or public life, and yet such intimate discussions potentially provide landowners degrees of authority over facility siting locations, environmental remediation techniques, the utilization of specific development equipment and processes, and of course compensation. These provisions all resemble the objectives of a more traditional public planning process; however, the scope of participation in this process is severely altered. Unlike the democratic ideal embodied by the local governmental public planning process, large segments of the population are legally not able to participate (on account of not owning leasable land) and therefore are not able to directly benefit from the negotiations. It is unlikely there are many other land use changes occurring in the United States today besides wind and natural gas development that have such important considerations for the governance of land use change.

Planning and Energy Policy

Energy planners have typically been concerned with issues of NIMBY mentalities among local residents based on issues of proximity. Counter to this concern, this research shows proximity to be of little measurable concern to most respondents, with many other planning-related topics as much more important (including participation and regulation). While the two energy sources share a large number of land use characteristics, they are often represented in different lights, and this research instead shows that respondents appear to engage and react to wind and gas development similarly. Energy planners are often stymied by the technological

characteristics of a particular energy source, but concern may be less based on the type of energy than disruption to existing social, environmental, and economic patterns. Devine Wright (2009) has been active in expanding this narrative beyond proximity to include social and psychological disruption and this research will certainly help to support his work and advance a more complex conceptualization of residents near energy development locations that draws upon the fields of risk analysis. Additionally, as discussed above, this research has advanced the subject of landowner leasing of property and illustrated the important implications of leasing activity on attitudes towards development, participation in the planning process, and the collective negotiation of resource management strategies. As discussed heretofore, the planning discipline has not engaged "the private sphere" (and the two might be seen in many quarters as antithetical), and this work demonstrates that planning can occur outside of the public sphere and it is an important topic of academic inquiry, especially in the context of energy development planning.

Finally, as stated at the beginning of this section, this work treats wind and gas drilling similarly, as both part of a larger energy landscape, and the findings above illustrate a need for a more comprehensive strategy for the planning and siting of energy facilities. Such a strategy needs to incorporate cumulative assessment of other energy operations occurring in the area, regulatory congruence, the effect of wide-scale landowner leasing, and the types of impacts that residents perceive from these energy landscapes. The theory and methodology utilized in this research program can contribute a partial framework for such a strategy.

6-2.3 Rural Sociology

Rural sociologists, since at least the late 1960s, have encouraged the practice of social impact assessment (or SIA), whereby the social impacts (including some economic and psychological factors) of land use changes that are predicted, disclosed, and ideally mitigated

before development takes place, and that the observed impacts of the development are additionally measured and recorded once the development takes place. The practitioners of SIA have arguably been much more prolific at producing pre-development assessments of impact then recording the during and post-development effects. This has been especially true of impact assessments of wind energy, as most studies pertaining to wind energy address the concerns of residents before construction. This dissertation provides a large suite of data available to researchers on the impacts perceived post-construction of wind farm development, as well as unconventional natural gas drilling. The "impact matrices" employed here measure a wide range of impacts that residents perceive including economic, social, social-psychological, local government, and environmental variables. These perceived effects were measured against everything from proximity to place meanings to experiential characteristics, thus providing insight into the impacts that are felt at the local level and the level of seriousness or magnitude of these impacts in the minds of local landowners.

Furthermore, it is often assumed – although rarely tested – in the social sciences that an individual's perception of local impacts of a development will influence his or her summative attitudes towards that development. Here, this assumption is strongly affirmed overall, although an interesting level of unevenness emerges as to which types of perceived impact yield greater influence over resident attitudes and which perceived impacts do not yield such influence. Such unevenness in the effect these impacts have on perceptions show that it cannot be taken for granted that "impact = attitude change", as that is clearly not the case for certain variables.

This contribution provides the groundwork for further testing of this unevenness and possible confirmation that certain types of impacts may disproportionately affect resident attitudes towards development. Perhaps it is the case that variables found to not influence resident perceptions in this instance (such as crime, water quality, traffic, etc.) generally do not influence attitudes towards development in any other instance of land use change or energy

development. Previous research by other sociologists has examined on the extent to which these different impacts influence resident attitudes on development, however how these different impacts compare with one another in influencing attitudes is generally not well understood(i.e. how fears of crime compare to water quality issues, etc). This dissertation helps to provide an avenue for this future research.

6-3 Limitations and opportunities for future research

There are a number of limitations to this work, a number of opportunities for future analysis and application of these findings, and a number of lessons that could be learned for future research.

The total academic contribution of this work is limited by several factors, some methodological and some contextual.

6-3.1 Sample Representativeness

The biggest constraint of the survey research is likely one of representativeness. The technique of using the property tax records for the generation of a survey sample ensured that non-landowners were not included in the survey sample. Non-property owners represent a distinct and important population of residents in both the Armenia Mountain area and in society as a whole. Landowners are important constituents in the decision making process – especially in the context of private-participation discussed earlier – however large segments of the population are not participants in this process and their viewpoints are not represented in this research. Nearly one in four residents of Armenia Mountain is a renter, according the US Census Bureau, and it is possible—even likely--that their views differ systematically from those of property owners. As Fishel (2001) notes that, for many citizens, private property ownership (especially their primary residence) represents by far both the largest and riskiest financial decision they will make in their lifetimes. If and how the ownership of these assets affects

attitudes and perceptions of impact from energy development, and how this ownership interacts with other variables such as community place meanings remains unknown. The geospatial data inherent in the property tax data was helpful (if not required) to perform the proximity analysis, to reach second home owners, and to select out industrial and commercial properties from the survey design.

Additionally, due in part to the property tax database, respondents to this survey were far more likely to be male than the population as a whole. Additionally, they were more likely to have received higher education than the population as a whole, although gender and education did not appear to influence the results of this survey. The survey did not ask respondents for information about their income or political affiliation, and the effects of these factors are not known.

6-3.2 Peculiarities of the Research Location

Armenia Mountain also represents but one case study in the larger phenomena of land use change and energy development. The area is representative of many rural areas of the United States, including that of declining agricultural past, afforestation, gradual population loss, a diversity of primary and secondary homes, small towns and villages, and mixed natural amenities..

However, Armenia Mountain is somewhat distinct in that it does not have a legacy of resource extraction that is present in many other areas (although the commonwealth as a whole does have such a legacy), nor is it within easy driving distance of a major metropolitan area, nor are there other major industrial facilities nearby all of which could influence resident attitudes and perception of impact. A future study in a research setting that contains these historical and cultural facets of industrialization and extraction not present in the Armenia Mountain context

would provide an important and interesting contrast to test the types of perceived impact and their relationship to resident attitudes found in the Armenia Mountain area.

6-3.3 Longitudinal Considerations

As is noted throughout the dissertation, energy development researchers have repeatedly called for the field to move beyond case study approaches to ones that favor longitudinal and comparative analyses. Despite recognizing these limitations of previous research, this dissertation in itself does not heed this call, although it can provide a baseline set of data for a larger suite of research that measures changes over time. Previous research has shown that resident attitudes can change – even dramatically – over time and that is likely to be the case in Armenia Mountain area as new development occurs, as residents become accustomed to the development and changes wrought, and as the cultural identity comes to reflect the these facets of the landscape and community.

6-3.4 Limitations of the survey instrument (and thus, some lessons learned)

There are a number of instances in which a slightly altered survey design or methodological approach could have yielded a more comprehensive and utilizable result.

Length of the survey instrument itself was serious consideration and limiting factor in the design of the instrument. The scope of variables to be measured was ambitious, including a comprehensive range of attitudes and impacts across both wind and natural gas development, as well as measures of environmental attitudes, place attachment, place meaning, leasing status, planning participation and information gathering, residency type, and socio-demographic background. Yet, in retrospect, the strong response rate (58%) seems to suggest that respondents did not find the instrument length to be overly onerous..

It is regrettable that questions were not asked on the survey to measure landowner *preferences* for the future planning and siting of these facilities. One question was asked to measure future landowner behavior. When measured against the variables listed above, these landowner preferences could yield a large degree of insight in the relationship between various landowner-residents and their preferences for the planning and regulatory process. The theoretical and practical basis of the implications of "private vs. public participation" in Chapter 4 would be strengthened by such data.

Finally, during the formation of the survey instrument, a number of "place at risk" measurement scales were devised, but ultimately stricken from the survey due to space considerations. In retrospect, a relatively small scale could have been added to the instrument to ask respondents to gauge how they predict place meanings would change with added wind and/or gas development. While Armenia Mountain in 2011 was far from the pre-development phase that is discussed in Chapter 2, such a scale would serve to directly test the theoretical basis of the dissertation using the survey results.

6-4 Future analysis of this data

While the analysis of the data contained in three chapters of this dissertation is extensive, it is in no way exhaustive. There are a number of components of this data set that have yet to be fully explored, and the analysis performed thus far has uncovered the possible utility of new kinds of data analysis.

6-4.1 Structural Equation Modeling

As noted in Chapter 3, factor analyses determined that place meanings and perceived impact for both gas and wind could be grouped into a total of more than 12 categories. While multiple regression models were used to determine the relationship between many of the variables grouped together and variables such as place attachment, attitudinal measures, and

socio-demographic data, Structural Equation Modeling (SEM) is a tool uniquely suited to measure relationships between each of these categories and place variables such as place attachment, attitudinal measures, and socio-demographic data. This approach may provide a new look into the relationship of these variables and ferret out patterns in the data that were not observed using bivariate correlations or multivariate regression analysis. Of particular interest may be the relationship between place attachment and individual categories of place meaning, and in turn their relationship with impact categories. Also of interest are the various impact categories that were comprised of individual types of impact such as the "personal cost" impact category that did not seem to influence resident attitudes towards gas or wind. SEM may be able to provide greater insight into the individual variables that comprise the personal cost category and their relationship to energy attitudes.

6-5 Conclusion

This dissertation is in many ways the product of assisting rural communities for the past eight years with overcoming challenges related to natural gas development. It has become apparent that the challenges related to siting energy projects in rural areas are, to borrow a phrase from the pollution lexicon, "multi-media," in that they arrive in local communities via social, economic, and environmental mediums. Even specifically within the realm of impacts to the social fabric, challenges appear in the efficacy of local governance, in the continuation of cultural traditions, in the disrupted psychology of local residents, and in the indicators of social well-being such as rates of crime, costs of living, and qualities of life. Experiencing first hand as residents assess, reflect upon, and attempt to mitigate the impacts of energy development in different communities in the pre-development, development, and post-development phases has influenced the scope, approach, and interpretation of this work.

Regulators and industry officials expect rapid growth in the natural gas and wind energy sectors, with tens or even hundreds of thousands of wind turbines and gas wells expected to be constructed on shore in the next few decades (USDOE 2008). It is likely that these energy sources will remain among the largest land uses in the Unites States for some time, and hopefully this research will provide theory, method, and data that can aid in the study, and ultimately successful siting and management, of these land use changes.

6-6 References

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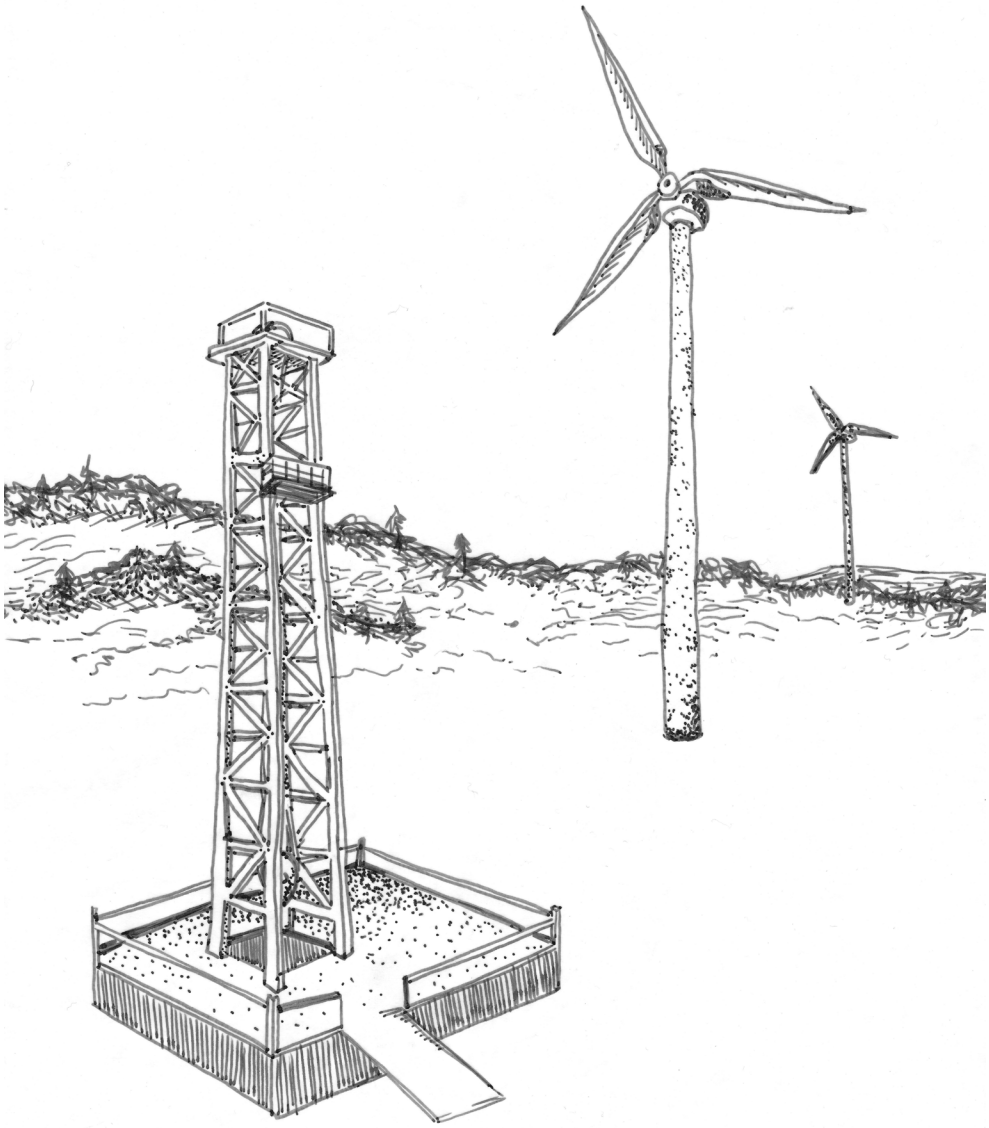
APPENDIX A:

A SURVEY OF NORTHERN PENNSILVANIA LANDOWNERS: YOUR VIEWS ON WIND AND NATURAL GAS DEVELOPMENT

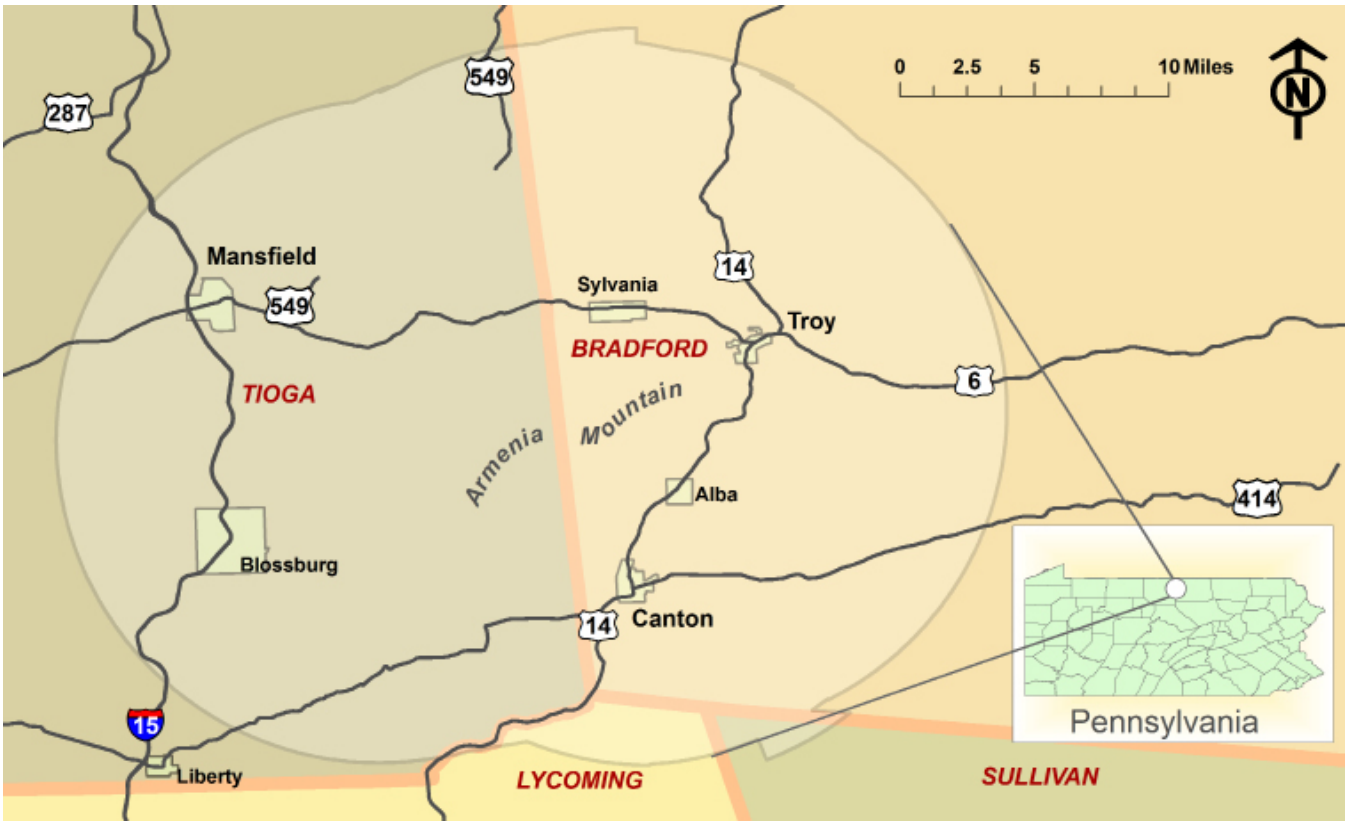
A Survey of Northern Pennsylvania Landowners



Your Views on Wind and Natural Gas Development

Cornell University
Department of Natural Resources
Human Dimensions Research Unit

With Support From Penn State Cooperative Extension



Survey Study Area

This survey is to learn how you view the development of wind and natural gas energy in the Armenia Mountain region of Northern Pennsylvania. Both wind and natural gas energy are expanding across all parts of the United States, and ***your views can help guide future planning, permitting, and construction efforts.***

Your name was randomly selected from publicly-available property tax records.

We request your views specifically on **the region surrounding Armenia Mountain in Bradford and Tioga Counties shown above** regardless of who you are, where you live year-round, or your level of knowledge on this topic.

Your identity and responses ***will be kept strictly confidential*** and the information you give us will never be associated with your name. Please complete this survey at your earliest convenience, seal it in the white envelope provided, and drop it in any mailbox; return postage has been provided. Your participation in this survey is voluntary, but we sincerely hope you will take just a few minutes to answer our questions.

If you have any questions or concerns about this survey, please contact Jeffrey Jacquet, Department of Natural Resources, Cornell University at 607-351-9886 or jbj47@cornell.edu.

THANK YOU FOR YOUR HELP!

Questions About You

1. For how many years have you been spending time in this area of Pennsylvania?

____ YEARS

2. How much time per year do you spend in this area of Pennsylvania?

□ I am a year-round resident *OR* about _____ days per year.

3. What type of property do you own in the area? *(Check all that apply)*

□ Permanent Residence
□ Seasonal Residence
□ Rental Property
□ Commercial or Industrial Property
□ Land Parcels Without a Residence
□ Other (please explain)_____

4. How long have you owned property in this area? _____YEARS

5. How many acres of land do you own in this area? _____ ACRES

6. How would you describe the area where the property is located? *(Check one.)*

□ A city
□ A small town
□ A suburban area
□ In the country, but not on a farm
□ On a farm

7. To what extent do you support or oppose the following energy sources?
(Check one box for each row.)

Energy sources	Strongly Oppose	Oppose	Neither	Support	Strongly Support
Wind Energy	□	□	□	□	□
Natural Gas Energy	□	□	□	□	□
Coal Energy	□	□	□	□	□
Biofuel Energy	□	□	□	□	□

8. To what extent do you agree or disagree with the following statements about the study area? *(Check one box for each row.)*

Thoughts about the study area	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
It is my favorite place to be.	☐	☐	☐	☐	☐
For the things I enjoy most, no other place can compare.	☐	☐	☐	☐	☐
Everything about it is a reflection of me.	☐	☐	☐	☐	☐
I feel happiest when I am there.	☐	☐	☐	☐	☐
It is the best place to do the things I enjoy.	☐	☐	☐	☐	☐
I feel that I can really be myself there.	☐	☐	☐	☐	☐

9. To what extent do you agree or disagree with the following statements about the study area? *(Check one box for each row.)*

Thoughts about the study area	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
It is a tourist destination.	☐	☐	☐	☐	☐
It is an industrial area.	☐	☐	☐	☐	☐
It has wilderness qualities.	☐	☐	☐	☐	☐
It's a good place to "get away".	☐	☐	☐	☐	☐
It has poor environmental health.	☐	☐	☐	☐	☐
It has outstanding natural beauty.	☐	☐	☐	☐	☐
It offers great recreation opportunities.	☐	☐	☐	☐	☐
It has been in economic decline.	☐	☐	☐	☐	☐
The people are very friendly.	☐	☐	☐	☐	☐
The community is "close-knit".	☐	☐	☐	☐	☐
Newcomers are welcome here.	☐	☐	☐	☐	☐

10. To what extent do you agree or disagree with the following statements about the environment? *(Check one box for each row.)*

Thoughts about the environment	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
The balance of nature is very delicate and easily upset.	☐	☐	☐	☐	☐
Humans are severely abusing the environment.	☐	☐	☐	☐	☐
The so-called ‘‘ecological crisis’’ facing humankind has been greatly exaggerated.	☐	☐	☐	☐	☐
If things continue on their present course, we will soon experience a major ecological catastrophe.	☐	☐	☐	☐	☐
Humans were meant to rule over the rest of nature.	☐	☐	☐	☐	☐
Human ingenuity will insure that we do not make the earth unlivable.	☐	☐	☐	☐	☐
We are approaching the limit of the number of people the earth can support.	☐	☐	☐	☐	☐
The balance of nature is strong enough to cope with the impacts of modern industrial nations.	☐	☐	☐	☐	☐

11. Indicate whether each of the following persons is currently or has been employed (either part-time or full time) within the wind or the natural gas industry? *(check all that apply)*

Employment	Currently in Gas Industry	Previously In Gas Industry	Currently in Wind Industry	Previously In Wind Industry
Yourself	☐	☐	☐	☐
Other Household Members	☐	☐	☐	☐
Friends	☐	☐	☐	☐
Relatives	☐	☐	☐	☐

Questions about the Armenia Mountain Wind Farm

12. Do you have a lease with a wind energy company? ☐ Yes or ☐ No

> ***If yes***, do you receive compensation? ☐ Yes or ☐ No

13. Do you have a wind turbine(s) or related development on your property? ☐ Yes or ☐ No

>***If yes***, do you receive compensation? ☐ Yes or ☐ No

>***If no***, approximately how close is the nearest wind turbine to your property? _____ MILES

14. How often do you notice wind tubines at the following locations? *(check one box for each row)*

When At Home:	☐ Often	☐ Sometimes	☐ Never
When Driving:	☐ Often	☐ Sometimes	☐ Never
When In Town:	☐ Often	☐ Sometimes	☐ Never
When Spending Time Outdoors:	☐ Often	☐ Sometimes	☐ Never

15. How have you received most of your information on the Armenia Mountain Wind Farm? *(Check one)*

☐ Word of Mouth
☐ Newspaper Articles
☐ Public Meetings
☐ Notices in the Mail
☐ Websites
☐ Discussions with Wind Developers
☐ Discussions with Government Officials
☐ Received very little or no information
☐ Other (please explain)
_____

16. If you were active in the permitting and planning process for the Wind Farm, in what way(s) were you active? *(Check all that apply)*

☐ Attended Public Meetings
☐ Attended rallies or events
☐ Wrote Letters to the Newspaper
☐ Other _____
☐ Donated to groups active on the issue
☐ Signed petitions or other documents
☐ Wrote Letters to Government Agencies
☐ I Was Not Active

The questions on this page ask you to circle a number on a scale from 1 to 5:

17. How informed do you feel about the Armenia Mountain Wind Farm?

Very Uninformed 1 2 3 4 5 Very Informed

18. Do you feel like you have been given enough opportunities to participate in the planning and permitting process for the Armenia Mountain Wind Farm?

No Opportunity 1 2 3 4 5 Enough Opportunity

19. What was your attitude towards the Wind Farm *before it was built*?

Very Negative 1 2 3 4 5 Very Positive

20. How has your attitude towards the Wind Farm changed *since it has been built*?

More Negative 1 2 3 4 5 More Positive

21. Has the construction of the Wind Farm made your attitude towards wind energy *in general* more positive or negative?

More Negative 1 2 3 4 5 More Positive

22. Assuming that you ***would not*** receive economic compensation, how supportive would you be if an energy company wanted to build a wind turbine on your ***neighbor's*** property?

Very Unsupportive 1 2 3 4 5 Very Supportive

23. Assuming that you ***would*** receive economic compensation, how supportive would you be if an energy company wanted to build a wind turbine on ***your*** property?

Very Unsupportive 1 2 3 4 5 Very Supportive

24. Would you say the construction of the Wind Farm has made the study area better off or worse off than it was five years ago?

Much Worse Off 1 2 3 4 5 Much Better Off

25. If 60 additional wind turbines were constructed in the study area, would you say that the study area will be better off or worse off in five years compared to how it is now?

Much Worse Off 1 2 3 4 5 Much Better Off

26. How likely would you be to sell your property due to the construction of additional wind turbines?

Very Unlikely 1 2 3 4 5 Very Likely

27. The following table asks you to identify how the Wind Farm has changed certain facets of the study area *(Check on box for each row)*

	Type of Change				
Effect From The Wind Farm On	Very Negative	Negative	Neither Negative Nor Positive	Positive	Very Positive
Property Values	☐	☐	☐	☐	☐
Area Employment	☐	☐	☐	☐	☐
Sense of Community	☐	☐	☐	☐	☐
Area Economic Health	☐	☐	☐	☐	☐
Tourism Industry Health	☐	☐	☐	☐	☐
Agriculture Industry Health	☐	☐	☐	☐	☐
Hunting and Fishing	☐	☐	☐	☐	☐
Outdoor Recreation	☐	☐	☐	☐	☐
Amount of Noise	☐	☐	☐	☐	☐
Area's Scenic Beauty	☐	☐	☐	☐	☐
Overall Environmental Health	☐	☐	☐	☐	☐
Your Attachment to the Area	☐	☐	☐	☐	☐
Quality of Social Relations	☐	☐	☐	☐	☐
Trust in Local Government	☐	☐	☐	☐	☐
Trust in Wind Developer	☐	☐	☐	☐	☐
Your Pride in the Community	☐	☐	☐	☐	☐
Amount of Crime	☐	☐	☐	☐	☐
Amount of Traffic	☐	☐	☐	☐	☐
Quality of Government Services	☐	☐	☐	☐	☐
Local Energy Prices	☐	☐	☐	☐	☐
Overall Quality of Life	☐	☐	☐	☐	☐
Overall Cost of Living	☐	☐	☐	☐	☐
Health of Area Residents	☐	☐	☐	☐	☐

Questions About Natural Gas Drilling

28. Do you have a gas lease with an energy company? ☐ Yes or ☐ No

29. Do you have gas wells or related development on your property? ☐ Yes or ☐ No

>***If yes***, do you receive compensation? ☐ Yes or ☐ No

>***If no***, approximately how close is the nearest gas well to your property? _____ MILES

30. How often do you notice gas development activity at the following locations? *(check one box for each row)*

When At Home:	☐ Often	☐ Sometimes	☐ Never
When Driving:	☐ Often	☐ Sometimes	☐ Never
When In Town:	☐ Often	☐ Sometimes	☐ Never
When Spending Time Outdoors:	☐ Often	☐ Sometimes	☐ Never

31. How have you received most of your information on the development of natural gas wells in the study area? *(Check one.)*

- ☐ Word of Mouth
- ☐ Newspaper Articles
- ☐ Public Meetings
- ☐ Notices in the Mail
- ☐ Websites
- ☐ Discussions with Energy Developers
- ☐ Discussions with Government Officials
- ☐ Received very little or no information
- ☐ Other (please explain) _____

32. If you were active in the permitting, planning, and development process of natural gas development in what way(s) did you participate? *(Check all that apply)*

- ☐ Attended Public Meetings
- ☐ Attended rallies or events
- ☐ Wrote Letters to the Newspaper
- ☐ Other _____
- ☐ Donated to groups active on the issue
- ☐ Signed petitions or other documents
- ☐ Wrote Letters to Government Agencies
- ☐ I Was Not Active

33. How informed do you feel about the about the natural gas drilling in the study area?

Very Uninformed 1 2 3 4 5 Very Informed

34. Do you feel like you have been given enough opportunities to participate in the planning and permitting process for natural gas drilling in the study area?

No Opportunity 1 2 3 4 5 Enough Opportunity

35. What was your attitude towards natural gas drilling *before it occurred*?

Very Negative 1 2 3 4 5 Very Positive

36. How has your attitude towards natural gas drilling changed *since it has occurred?*

More Negative 1 2 3 4 5 More Positive

37. Has the development of natural gas made your attitude towards natural gas energy *in general* more positive or negative?

More Negative 1 2 3 4 5 More Positive

38. Assuming that you ***would not*** receive economic compensation, how supportive would you be if an energy company wanted to develop natural gas on your ***neighbor's*** property?

Very Unsupportive 1 2 3 4 5 Very Supportive

39. Assuming that you ***would*** receive economic compensation, how supportive would you be if an energy company wanted to develop natural gas on ***your*** property?

Very Unsupportive 1 2 3 4 5 Very Supportive

40. Would you say the development of natural gas has made the study area better off or worse off than it was five years ago?

Much Worse Off 1 2 3 4 5 Much Better Off

41. If current levels of natural gas development were continue for another 5 years, would you say that the study area will be better off or worse off in five years compared to how it is now?

Much Worse Off 1 2 3 4 5 Much Better Off

42. How likely would you be to sell your property due to 5 more years of natural gas development?

Very Unlikely 1 2 3 4 5 Very Likely

43. The following table asks you to identify how the development of natural gas has changed certain facets of the study area : *(Check on box for each row)*

	Type of Change				
Effect From Natural Gas Development On:	Very Negative	Negative	Neither Negative Nor Positive	Positive	Very Positive
Property Values	☐	☐	☐	☐	☐
Area Employment	☐	☐	☐	☐	☐
Sense of Community	☐	☐	☐	☐	☐
Area Economic Health	☐	☐	☐	☐	☐
Tourism Industry Health	☐	☐	☐	☐	☐
Agriculture Industry Health	☐	☐	☐	☐	☐
Hunting and Fishing	☐	☐	☐	☐	☐
Outdoor Recreation	☐	☐	☐	☐	☐
Amount of Noise	☐	☐	☐	☐	☐
Area's Scenic Beauty	☐	☐	☐	☐	☐
Overall Environmental Health	☐	☐	☐	☐	☐
Attachment to the Area	☐	☐	☐	☐	☐
Quality of Social Relations	☐	☐	☐	☐	☐
Trust in Local Government	☐	☐	☐	☐	☐
Trust in Energy Developer	☐	☐	☐	☐	☐
Your Pride in the Community	☐	☐	☐	☐	☐
Amount of Crime	☐	☐	☐	☐	☐
Amount of Traffic	☐	☐	☐	☐	☐
Quality of Government Services	☐	☐	☐	☐	☐
Quality of Water	☐	☐	☐	☐	☐
Local Energy Prices	☐	☐	☐	☐	☐
Overall Quality of Life	☐	☐	☐	☐	☐
Overall Cost of Living	☐	☐	☐	☐	☐
Health of Area Residents	☐	☐	☐	☐	☐

44. To what extent do you agree or disagree with the following statements about developing both energy sources in the same area? *(Check one box for each row.)*

Thoughts about the study area:	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
It is beneficial to develop gas and wind energy in the same place and time.	☐	☐	☐	☐	☐
The gas and wind developments are very compatible with each other.	☐	☐	☐	☐	☐
It is "too much" to develop both energy sources at the same place and time	☐	☐	☐	☐	☐
Gas and wind developments have a lot in common.	☐	☐	☐	☐	☐

Questions About Yourself

45. In what year were you born? _____ *(Year)*

46. What is your gender?

☐ Male ☐ Female

47. What is the highest level of education you have completed? *(Check one.)*

☐ Some high school
☐ High school graduate/GED
☐ Some college or other post-high school education
☐ Completed a 4-year college degree
☐ Graduate work or graduate degree

Thank You So Much For Your Time!

Feel free to attach any comments you may have.
Simply seal this survey in the white envelope provided and drop into any mailbox. Postage is already paid for.

PENNSTATE

Cooperative Extension
in Bradford County

701 South Fourth Street
Towanda, PA 18848

Phone: (570)265-2896
Fax: (570)265-4371
E-mail: BradfordExt@psu.edu
Web: Bradford.extension.psu.edu

April 22nd, 2011.

Dear Landowner,

I am writing to encourage you to complete this survey being administered by Cornell University's Department of Natural Resources.

Over the past 3 years we have worked closely with Cornell on issues related to energy development and Marcellus Shale natural gas drilling, and Penn State and Cornell have developed a history of sharing information and research.

The results of this survey effort will be shared with Penn State Cooperative Extension and will help us better understand the issues being faced by our local residents. Please know that Cornell will keep your individual response strictly confidential and that it cannot be linked to your name.
.
Wind and natural gas development has brought lots of changes to our communities and our landscape, understanding how you view these changes will not only help us to understand how we at extension can serve you better, but our experiences can help to teach other parts of Pennsylvania and the United States what to expect and how to manage these rural energy transformations.

Thank you in advance for your assistance in this effort.

Best regards,

Mark Madden
County Agricultural Agent – Penn State Extension

PENNSTATE

Jeffrey J. Himes
Community Development &
Rural Leadership Educator

Penn State **Extension**
118 Main Street
Courthouse Annex
Wellsboro PA 16901

Phone: 570-724-9120
Fax: 570-724-8137
E-mail: jhimes@psu.edu
Web: extension.psu.edu/tioga

April 15, 2011

Dear Landowner,

I am writing to encourage you to complete this survey, Your Views on Wind and Natural Gas Development, being administered by Cornell University's Department of Natural Resources. Over the past 3 years we have worked closely with Cornell on issues related to energy development and Marcellus Shale natural gas drilling, and Penn State and Cornell have developed a history of sharing information and research.

The results of this survey effort will be shared with Penn State **Extension** and will help us better understand the issues being faced by our local residents. Please know that Cornell will keep your individual response strictly confidential and that it will not be linked to your name.

Wind and natural gas development have brought lots of changes to our communities and our landscape. Understanding how you view these changes will not only help us understand how Extension can serve you better, but your experiences can help teach other parts of Pennsylvania and the United States what to expect and how to manage these rural energy transformations.

Thank you in advance for your assistance in this effort.

Jeffrey J. Himes
Penn State **Extension**

April 22nd, 2011

Dear Landowner,

Enclosed you will find a survey asking for your views on the development of Wind Energy and Marcellus Shale Natural Gas Energy in Northern Pennsylvania.

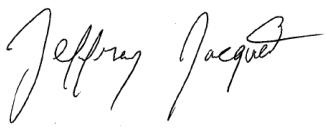
You were randomly chosen for this survey because public records show you own property within a 10-mile region surrounding the Armenia Mountain area of Northern Pennsylvania (please see the map inside of the survey). As a landowner, we are very interested in your views on the energy developments occurring in this specific area, regardless of where you may live, your level of knowledge on these developments, or how you utilize your land.

The responses you return to us will be kept strictly confidential. No one will match your name to the individual answers you provide. The larger findings of this research will be shared with local leaders in Tioga and Bradford Counties and Penn State Cooperative Extension, and can help to guide future energy planning and permitting by identifying the positive and negative issues faced by local residents and property owners such as you.

Your participation is, of course, voluntary. However, we hope that you will help us to further research on the effects of energy development and land use. Simply complete this questionnaire at your earliest convenience, seal it in the envelope provided, and drop it in any mailbox, all the postage has already been paid for.

Thank you in advance for your participation. Please don't hesitate to contact me if you have any questions or concerns about this survey effort.

Sincerely,



Jeffrey B. Jacquet
Dept. of Natural Resources, Cornell University and
Adjunct Professor of Sociology, Corning Community College, Corning, NY
Tel: 607-351-9886 Email: jbj47@cornell.edu

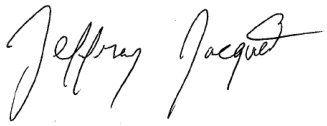
April 29th, 2011

Dear Landowner,

Last week you should have received a survey packet from Cornell University asking for your views on wind and natural gas energy development occurring in Northern Pennsylvania. If you returned that survey to us, then please disregard this notice. If you have yet to return the survey, then please consider doing so at your earliest convenience. The details are enclosed in the survey and the return postage is already paid for.

Thank you in advance for your participation. Please don't hesitate to contact me if you have any questions or concerns about this survey effort.

Sincerely,



Jeffrey B. Jacquet
Dept. of Natural Resources, Cornell University and
Adjunct Professor of Sociology, Corning Community College, Corning, NY
Tel: 607-351-9886 Email: jbj47@cornell.edu

May 13th, 2011

Dear Landowner,

About three weeks ago we sent you a survey asking for your views on the development of Wind Energy and Marcellus Shale Natural Gas Energy in Northern Pennsylvania. In case the survey was lost, we are enclosing another copy. **If you have previously returned this survey, then accept our thanks and kindly disregard this notice.**

You were randomly chosen for this survey because public records show you own property within a 10-mile region surrounding the Armenia Mountain area of Northern Pennsylvania (please see the map inside of the survey). As a landowner, we are very interested in your views on the energy developments occurring in this specific area, regardless of where you may live, your level of knowledge on these developments, or how you utilize your land.

The responses you return to us will be kept strictly confidential. No one will match your name to the individual answers you provide. The larger findings of this research will be shared with local leaders in Tioga and Bradford Counties and Penn State Cooperative Extension, and can help to guide future energy planning and permitting by identifying the positive and negative issues faced by local residents and property owners such as you.

Your participation is, of course, voluntary. However, we hope that you will help us to further research on the effects of energy development and land use. Simply complete this questionnaire at your earliest convenience, seal it in the envelope provided, and drop it in any mailbox, all the postage has already been paid for.

Thank you in advance for your participation. Please don't hesitate to contact me if you have any questions or concerns about this survey effort.

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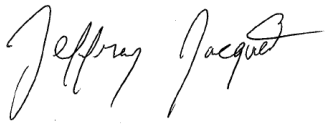


Jeffrey B. Jacquet
Dept. of Natural Resources, Cornell University and
Adjunct Professor of Sociology, Corning Community College, Corning, NY
Tel: 607-351-9886 Email: jbj47@cornell.edu

May 20th, 2011

Dear Landowner,

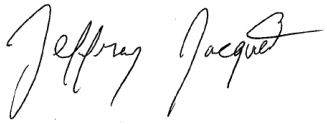
I am writing to you once more to encourage you to participate in a survey from Cornell University asking for your views on wind and natural gas energy development occurring in Northern Pennsylvania.

Although we have received a large number of completed questionnaires, we have not heard from you. Even if you have little interest or knowledge on energy development in this area, we ask you to complete the survey anyway so we can receive an accurate representation of landowners in the area.

If you returned that survey to us, then please disregard this notice. If you have yet to return the survey, then please consider doing so at your earliest convenience. The details are enclosed in the survey packet and the return postage is already paid for.

Thank you in advance for your participation. Please don't hesitate to contact me if you have any questions or concerns about this survey effort.

Sincerely,



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APPENDIX B:

NATURAL GAS LANDOWNER COALITIONS IN NEW YORK STATE: EMERGING BENEFITS OF COLLECTIVE NATURAL RESOURCE MANAGEMENT

Journal of Rural Social Sciences, 26(1), 2011, pp. 62–91.

NATURAL GAS LANDOWNER COALITIONS IN NEW YORK STATE: EMERGING BENEFITS OF COLLECTIVE NATURAL RESOURCE MANAGEMENT

JEFFREY JACQUET
CORNELL UNIVERSITY

and

RICHARD C. STEDMAN
CORNELL UNIVERSITY

ABSTRACT

Thousands of rural landowners in New York State have joined together to form grassroots organizations aimed at collectively bargaining with natural gas companies. The leverage afforded by acting collectively allows these landowner coalitions to potentially influence the economic, environmental, and community impacts of gas development across hundreds of thousands of acres. In-depth interviews with coalition leaders conducted for this article reveal the scope, motivations, and benefits of membership in these groups. Our work examines these elements using multiple frameworks for understanding collective natural resource management. The coalitions are primarily concerned with the advancement of private member benefits, while public benefits of the collective action are poised to accrue indirectly. Group leaders are also contemplating how to use their leverage to secure direct benefits for the wider community – actions that may give communities a modicum of local control over gas development.

New types of energy development emerging across the rural United States – such as wind, unconventional natural gas, and biofuels – primarily depend on large swaths of contiguous land that is often owned by many individual landowners (Franklin et al. 2010). The potential for collective action among these landowners during the development process offers an array of implications for rural communities, environmental landscapes, and domestic energy production. Along the southern border of central New York State, in an area known as the Southern Tier Region, rural landowners have formed grassroots organizations aimed at collectively bargaining with natural gas companies over the terms of development leases in the Marcellus Shale natural gas formation. As of early 2011, these organizations – calling themselves landowner coalitions – have grown to claim more than 800,000 acres of rural landscape owned by more than 20,000 landowner-members, a sum that equals more than 20 percent of the land within this region (JLCNY 2010).

With the initial goal of securing financial benefits for their members, these coalitions – largely consisting of, and voluntarily led by, rural landowners – have

inadvertently become the de facto managers of natural resource development across vast and largely contiguous landscape scales. Besides setting rates of compensation, the leases these groups negotiate with energy companies serve as legally-binding operating agreements that can influence environmental and community outcomes. The traditional practice is for representatives (called landmen) from one or more energy companies to approach individual landowners in a "seller beware" transaction where the landowner is typically the less knowledgeable party (NYSAG 2008). The coalition phenomenon, in contrast, offers the prospect of increased landowner agency by turning this process into a much more uniform action that is centrally negotiated and managed by groups of local landowners.

This article describes the organization and emergence of these landowner coalitions in New York State and interprets them using existing frameworks of collective natural resource management. Although coalitions or associations are known to exist in other natural gas development areas such as Texas or Pennsylvania (Smith 2010), the landowner coalition movement in New York – while still very new – appears to be much larger and better organized. In 2008, pending a supplement to the existing New York State Generic Environmental Impact Statement (GEIS) for natural gas drilling, state regulators suspended critical natural gas development activities in the Marcellus Shale formation during the very height of land speculation and drilling interest (Office of the Governor, State of New York 2008). While drilling has increased dramatically in neighboring Pennsylvania, the stop in development in New York caused by the review has provided an opportunity for the coming-together and evolution of these groups. The vast acreages and higher economic stakes associated with the Marcellus Shale have helped to make collective negotiation an attractive option for landowners and the regulatory "time-out" has allowed some of these groups to transform into organized institutions aimed at providing landowner education and agency, political advocacy, and environmental management. Although uncertainty remains, state regulators expect the review to be completed and drilling permits to be issued again sometime in 2011 (Goldberg 2010).

Importantly, landowner coalition groups are operating in a local-level power vacuum. New York State has a long tradition of home rule that empowers municipal decision making; however, it is similar to other states in that it exempts such local authority in the case of oil and natural gas development (New York State 2010). As in many states, local municipalities in New York lack the capacity to exclude gas development though local land use regulations, and therefore lack the capacity to gain economic, social, and ecological concessions from energy firms (Kenneally and

Mathes 2010). Previous research into energy-impacted communities has shown that local municipalities are often required to provide a rapidly increased level of infrastructure and services during development phases while new sources of revenue are not equal to these costs (Gilmore 1976; Markussen 1978; Jacquet 2009).

Through local ordinance, or the leverage afforded by large landowners, communities in other energy contexts have sometimes been successful in negotiating with energy developers for public socioeconomic and environmental benefits, such as school and police facilities construction (OIA 1988), per-well payments to environmental mitigation funds (USDOI 2008), pace of development controls (Butler and Nelson 1994), and economic compensation (Peelle 1978). Some leaders have looked to the contractual leverage provided by the sheer scale of landowner coalitions as a proxy to municipal or community-based regulation of natural resource development, as the groups may hold the potential to exert greater influence over development than state regulators or local municipalities.

COLLECTIVE RESOURCE MANAGEMENT FRAMEWORKS

The use of collective action to economically leverage private natural resource development is certainly not new, and well-known examples include agricultural cooperatives (Knapp 1963), forest cooperatives (Kittredge 2005; Wolf and Hufnagl-Eichiner 2007), and common pool natural resource management organizations (Ostrom 1990). Several similarities between the landowner coalitions and forestry or agricultural cooperatives can be identified; the most critical of which – building from Olson (1965) – emphasizes the maximization of the individual outcomes of members, rather than a focus on the improvement of public goods. However, as with cooperatives, public goods may still emerge from the process, despite intent.

Emerging landowner coalition traits can also be compared with a framework of community-based natural resource management (CBRM). Much has been written and debated regarding the emergence and effectiveness of CBRM in the United States and abroad, with examples ranging from community forests to collective watershed management (Baker and Kusel 2003; Griffin 1999; Kellert et al. 2000; Stedman et al. 2009). CBRM is useful in this analysis as it offers a cooperative resource management framework that clearly moves beyond strictly "members-only" benefits to provide benefits for the public-at-large; but how the current and future activities and goals of the New York State landowner coalitions fit within a CBRM framework is as unclear as it is intriguing.

While case studies of collective action to manage natural resource development continue to accumulate, a paucity of analysis has been noted regarding collective

action that involves disparate actors across landscape-scales (Goldman, Thompson, and Daily 2007; Meinzen-Dick, DiGregorio, and McCarthy 2004; Poteete and Ostrom 2004). We utilize the provision of public goods in addition to member benefits as a potential bridge between a strict cooperative model and a CBRM framework. Specifically, our research examines: (1) the purposeful action toward public benefits by the coalitions; (2) the accruement of public benefits as an unintentional byproduct of their actions; and (3) the potential for progressive unfolding/expansion of these larger benefits over time. This article does not argue the merits of natural gas drilling, but it does indirectly compare the prospect of wide-scale natural gas development organized collectively by landowner coalitions to the scenario of wide-scale natural gas development that is privately negotiated with individual landowners.

THE MARCELLUS SHALE AND NATURAL GAS DEVELOPMENT IN NEW YORK STATE

The Marcellus Shale is a massive Devonian period sedimentary rock formation that stretches across the mid-Atlantic region from northern West Virginia though much of Pennsylvania and into the Southern Tier of New York State (see Figure 1) (Soeder and Kappel 2009). It is called an unconventional shale play – similar to the Barnett Shale in Texas or the Haynesville Shale in Louisiana—as the gas is trapped in microscopic pores within the formation instead of in a large gas pool as is found in "conventional" gas development. To exploit the small pores of gas, the well bore is drilled horizontally underground for a distance of several thousand feet and a mixture containing millions of gallons of water, sand, and chemicals is pumped at an extremely high pressure into the formation (a process called hydrofracturing) to create artificial fractures that connect these microscopic gas-bearing pores and allow the gas to flow though the well and up to the surface (Soeder and Kappel 2009). To fracture the maximum amount of shale formation, several horizontally-drilled wells can be drilled from a single surface location, and the well bores are methodically placed so that an underground carpet of well bores and fractures perforate a large portion of the formation. This technique, when compared with traditional extraction techniques, has been viewed as more akin to a manufacturing process (Farey 2010). While these advancements in well drilling and stimulation techniques have led to a reclassification of unconventional shale formations such as the Marcellus as economically recoverable, the array of

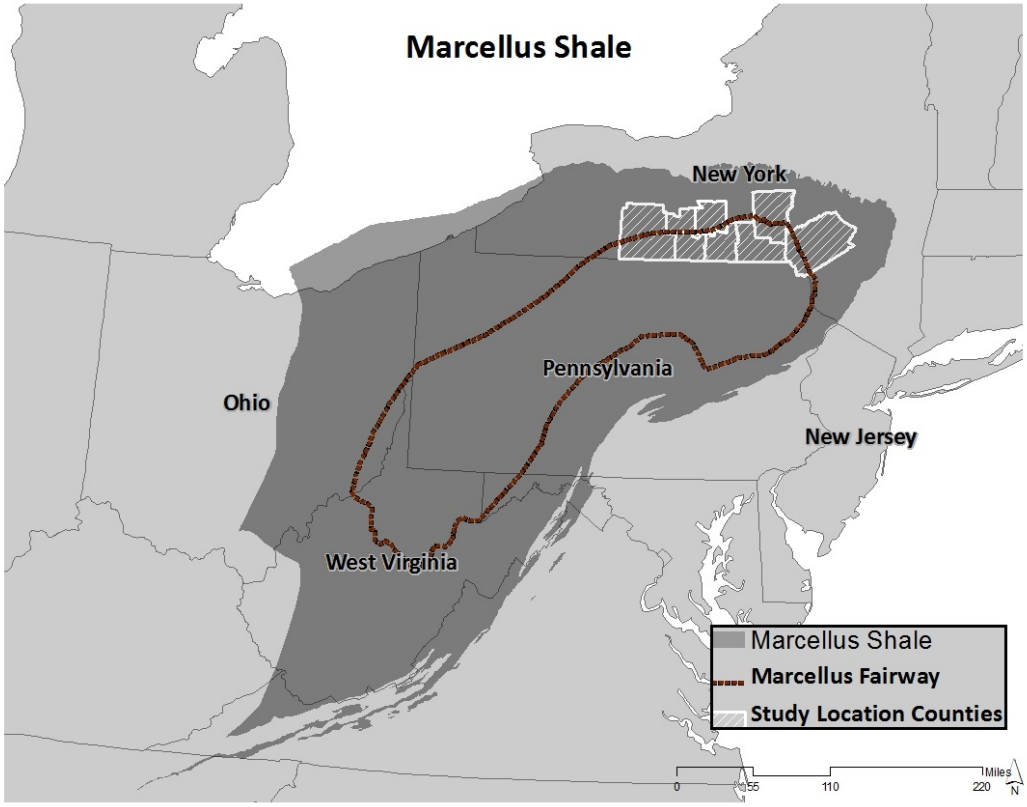

FIGURE 1. THE MARCELLUS SHALE REGION. FIGURE BY JEFFREY JACQUET.

horizontal wells presents a logistical challenge that requires obtaining subsurface drilling rights from many different property owners.

The high natural gas commodity prices of the mid 2000s and revised geological estimates of the total amount of recoverable gas in the Marcellus Shale have further incentivized development. Some estimates have predicted as much as 500 trillion cubic feet of recoverable natural gas in the Marcellus Shale, which would place the field among the largest on the planet (Englander 2009; Greico 2008). Much of the gas company interest has recently centered on a geologically attractive central swath of Pennsylvania called "the fairway" which reaches into the Southern Tier of New York State. While development of the Marcellus Shale began in West Virginia and southwest Pennsylvania as early as 2003, interest in developing the resource

in the fairway areas of northern Pennsylvania and New York State did not materialize until late 2007 (Harper 2008).

New York State has a long history of natural gas development, as the first commercial natural gas well was developed in 1825 in Fredonia, NY and gas storage operations exist along the southern border of the state (NYSERDA 2010). Several conventional natural gas fields have been developed in New York over the last 185 years and in 2008 there were more than 13,000 active wells that produced more than 50 billion cubic feet of natural gas (NYDEC 2010a; 2010b). However, the vast majority of this development was small in scale and intensity, and the wells were conventionally drilled and operated by locally-owned energy firms that paid modest royalties and leasing bonuses. This historical drilling activity has largely occurred in areas not currently facing Marcellus Shale development, although leasing activity has been commonplace throughout the Southern Tier for decades. Much of this leasing activity was highly speculative in nature, performed before development of the Marcellus Shale was thought to be feasible, and thus was negotiated for very low rates of compensation. An analysis of publically available information found that between 40 and 60 percent of land in the Southern Tier has been leased; however, given that the term of a lease is typically five years in duration and little new leasing has occurred since 2008, most leases will have reached expiration within the next few years (MAPTC 2011).

In contrast to historical activity, the Marcellus Shale offers the prospect of large national and international energy firms conducting intensive and industrial modern natural gas development across large swaths of southern New York. Such development can give landowners much larger leasing and royalty payments than previously received from conventional gas drilling, as well as the potential for much larger-scale environmental and community disruptions.

COLLECTIVE NATURAL RESOURCE MANAGEMENT

The Cooperative Model

The economic and ecological benefits of coordinated forest management among smaller private landowners have long been espoused by foresters and other landscape managers in the United States (Stoddard 1961; 1964). However, despite wide-scale implementation among forest owners in other countries, the practice is not widespread within the United States (Kittridge 2005). However, there has been an increased interest in coordinated forestry in recent years, and case studies highlight functional forestry cooperatives (Schulte, Rickenbach, and Merrick 2008). The now-defunct Sustainable Woods Cooperative – a venture in southwestern

Wisconsin that leveraged the local cooperation of more than 150 landowners for favorable harvesting practices and the cooperative ownership of lumber production facilities – is among the high profile examples (Gaskill 2003).

We view forest cooperatives as perhaps more analogous to the landowner coalitions than agricultural cooperatives given the forest cooperatives' often informal organizational structures and focus on natural resource extraction. The inhomogeneous organizational structures of the forest cooperatives can range from loose alliances of volunteer landowners that do little more than coordinate timber sales to formally staffed organizations that centrally produce and market upscale timber products (Gass et al. 2008; Klosowski et al. 2001). Moreover, the motivations of these groups can range from pure economic leverage, to strict ecological conservation, to the social benefits produced through community interaction (Rickenbach 2006a).

However, it has been noted that the vast majority of forest cooperatives are fundamentally businesses (Rickenbach 2006b:27), formed to advance the outcome of individual members and not the benefit of common goods or society as a whole (Tiles et al. 2004). Rickenbach (2006a) succinctly noted "(c)ooperatives are effective when they meet the needs of the members," and as such, membership in these forest cooperatives is reserved to the property owners, and community benefits are left to accrue only indirectly. The community benefits of the larger cooperative model have been noted, including the benefit of increased social capital (Merrett and Walzer 2004), and the retention of value-added business in the local community (Fulton and Anderson 2001). Nadeau and Wilson (2001) show that cooperative ventures can be effective in producing social and economic benefits to the larger community, although these benefits typically accrue as a byproduct of increasing benefits to cooperative members.

Community-based Resource Management

CBRM has emerged in recent years in a spate of great enthusiasm around the potential for locally-based management of forests (Baker and Kusel 2003), wildlife (Agrawal and Gibson 1999), and fisheries (Hviding and Baines 2008). Although Bradshaw (2003) has sounded some crucial cautionary notes, based on the credibility and capacity of communities to effectively manage their own resources, the general tide of management strategy has been toward the greater devolution of state power to the local level. Kellert et al. (2000) offered several core principles of CBRM. Briefly, these emphasize greater involvement of local community members in decision making and the devolution of power from more centralized authorities.

CBRM also involves the joint consideration of environmental and socioeconomic objectives and outcomes. Finally, CBRM emphasizes local knowledge and tradition, as expressed (for example) in local property rights and traditional values.

The success or failure of CBRM is based on, according to Kellert et al. (2000), the equitable distribution of benefits across a wide range of community members and the empowerment of community members (including the ability to effectively engage in conflict resolution and increased production and widespread distribution of knowledge and more sustainable use of resources). In our case, the existence of a community-level power vacuum, as described earlier, matters a great deal; as communities are unable to invoke the powers of home rule to either exclude all together or dictate the terms of leasing arrangements, the possibility increases that these groups of individual landowners may serve as one of the very few available avenues of community control over this resource development.

PROJECT LOCATION

The Southern Tier region of New York is located just north of Pennsylvania, part of the High Allegheny Plateau consisting of rolling hills and valleys primarily forested (more than 65 percent) with mixed hardwoods (NYSDEC 2006). Like much of the northeastern United States, the area is experiencing a trend of afforestation as agricultural use declines (NYSDEC 2010c). New York State has recognized the Southern Tier region as important for its biological diversity, especially regarding small-acreage wetlands, forests, and habitat for a broad range of taxa, and has identified large-scale forest management planning to be one of the biggest challenges facing the ecology of the region (NYSDEC 2006).

The Southern Tier is often considered part of the post-industrial Rust Belt, and has largely suffered from poor economic conditions during the latter half of the twentieth century (Thomas and Smith 2009). The region is known for its high levels of population loss among the already struggling northeast United States (McGranahan and Beale 2002). It typically rates below average regarding economic indicators such as rates of employment and Gross Domestic Product (NYSCAA 2010; Abel and Dietz 2008). The U.S. Census Bureau (2010) estimates the population of the eight Southern Tier counties studied in this paper (see Figure 2) to have decreased by nearly 31,000 residents, or about 6 percent, between 1990 and 2009. The region also contains one of the highest percentages of elderly persons in the United States, with persons aged 65 or older comprising 30 percent of the population in Broome County (He et al. 2005).

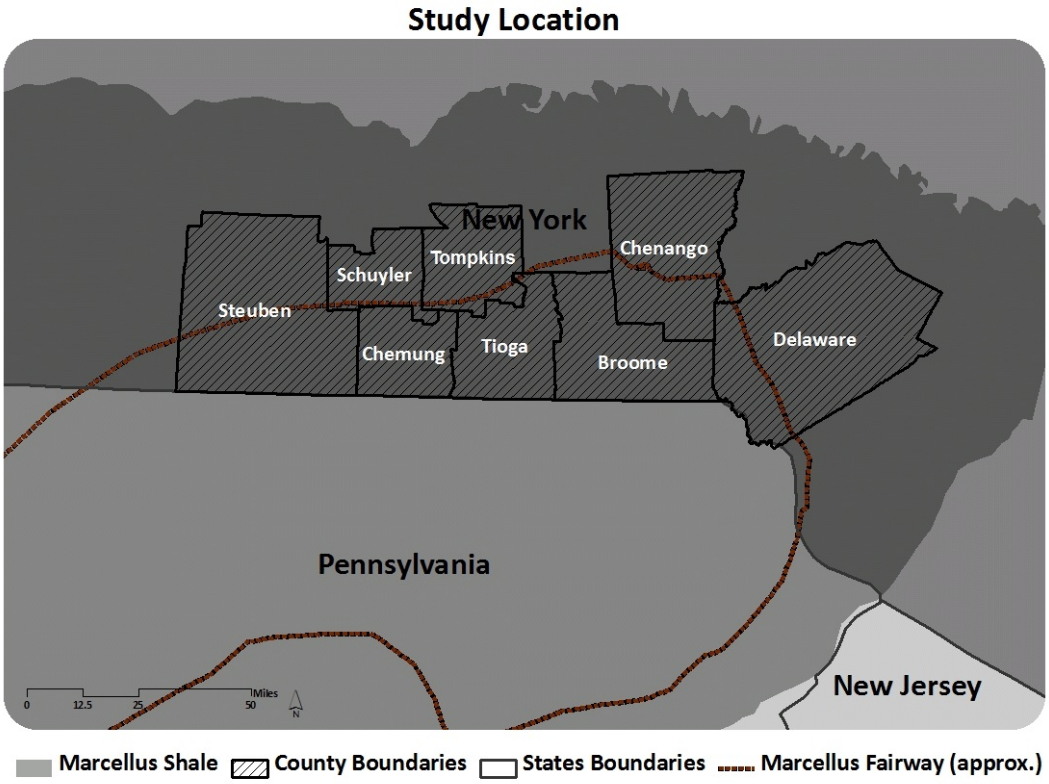

FIGURE 2. THE SOUTHERN TIER REGION OF NEW YORK, WITH THE COUNTIES THAT CONTAIN LANDOWNER COALITIONS EXPLORED IN THIS STUDY. CREATED BY JEFFREY JACQUET.

RESEARCH QUESTIONS

In this research, a primary goal was to obtain a better characterization of the coalition phenomenon, including the time lines of emergence, the numbers of organizations, membership and organizational attributes, and the sizes of acreages held. Our overarching inquiry considers the possibility of landowner coalitions as moving from a model that emphasizes member benefits to one that attempts to gain benefits for the public at large. Specifically, we asked three sets of questions:

- What types of benefits are emphasized or de-emphasized (e.g., environmental health, economic prosperity, social well being, etc.)? A related key question is

"for whom" are these benefits intended? Does the "community" only include members of the coalition? How are these boundaries related to the particular outcomes being considered?

A second set of questions involves the potential for indirect benefits.

- Do we have the sense that—regardless of intent—there are indirect community benefits of these lease negotiations? As with above, we ask which sorts of outcomes are most likely and for whom?

Thirdly, we engage the prospect of change over time:

- What do we envision as the future of these groups? If certain outcomes are not currently being realized, may these groups move to realize them in the future? What are the barriers and opportunities for such movement to occur?

METHODOLOGY

In the spring of 2010, we performed interviews with the principal organizers or leaders of each of the twelve larger or more active landowner coalitions in the state. In addition, a small focus group was performed with four leaders of two late-emerging coalitions that were starting to organize by mid-2010. The interview subjects were selected to represent the entire geographical area broadly (each of the eight counties considered in this study were represented by at least one interview subject). Most of the interview subjects were retired or semi-retired landowners with a long history of residence in the area, although two of the interview subjects were agricultural or county educators, and one subject was a legal consultant working with several coalitions. Given the emergent nature of the coalitions – and our focus on organizational history and goals – we determined that coalition leaders and/or organizers were best suited to provide these data, as they had been present since the beginning of the group organization and participate in nearly all group activities. Sixteen participants represented the leadership of nearly all of the largest coalitions in New York State.

All of the interviews were audio-recorded and transcribed, and each was between approximately 45 minutes and 2 hours in length. They were semi-structured, based on an interview protocol created to reflect the research questions above, focusing on the time lines, motivations, outcomes, and organizational structures of the coalitions and their members. Additional questions were asked

about how the role and goals of the coalitions may change though time, the role the coalitions play in the larger community, and lessons learned from the organizational process. A cross-case analysis of the transcript data was performed, and from these major categories of discussion, themes and sub-themes were identified and organized into a spreadsheet, and quotes that best represented the breadth and character of these data were culled from the transcripts (Fontana and Frey 2000).[1]

RESULTS

Scope of the Coalition Phenomenon

According to coalition websites and other promotional material, at least 35 coalitions exist in the Southern Tier of New York State. In aggregate, these coalitions claim more than 800,000 acres of land owned by more than 20,000 property owners, or an area equal equivalent to approximately 1,125 square miles (JLCNY 2010). By comparison, the entire area of the eight-county region in which they operate is 5,762 square miles, while the approximate area inside that region considered viable for gas drilling may be closer to 3,700 square miles. As such, these coalitions exert considerable influence over a substantial portion of the terrain considered attractive to gas drilling. Through the interviews, the leaders indicated that these figures generally represent landowners who have provided detailed parcel, lease, and contact information to the coalition, but are under no obligation to sign a lease negotiated by the coalition. One coalition leader described this affiliation as "in orbit around the coalition," while many more untallied landowners are taking a "wait and see" approach to membership (Martin).

The size, scope, and structure of these groups can range widely (see Table 1). The two largest coalitions are informal and volunteer-led organizations found in Steuben and Tioga Counties, claiming approximately 162,000 acres owned by 5,000 owners and 113,000 acres owned by 1,700 owners, respectively (SCLC 2010; TCLG 2010). Both groups have a leader or spokesperson and a central committee of volunteers that coordinates membership and activities. On the other end of the spectrum, some coalitions are formed by a handful of neighboring property owners owning a few hundred acres or by an entrepreneurial local attorney or leasing consultant who is typically paid a per-acre fee upon successful negotiation. Most of the organizations are somewhere between these extremes, with many comprising informal organizations representing tens of thousands of largely contiguous acres.

[1] We have attached a pseudonym to the end of each quotation to aid the reader in differentiating the source of the quotation while preserving the anonymity of interviewees.

Except for one group organized by a leasing consultant, all of the groups represented by our interview subjects were organized and are run by a committee of volunteers. Yet all are affiliated with an attorney or leasing consultant who performs the legal paperwork and negotiates the leasing terms with the energy company for the members. These coalitions require no fee to join, but will require a relatively small per-acre fee to offset the legal costs upon signing a lease with an energy company.

TABLE 1. LANDOWNER COALITIONS REPRESENTED BY INTERVIEW SUBJECTS

NAME	COUNTY	MEM. HHS	MEM. ACRES	YEAR FORMED	LEASE SGD*
Steuben County Coalition.	Steuben	5,000[a]	164,000[a]	2008[c]	No
Tioga Landowners Group.	Tioga	1,600+[b]	120,300[b]	2008[c]	No
Chemung County Coalition.	Chemung	1,000+[c]	80,000[c]	2008[c]	No
Windsor Coalition.	Broome	ND[f]	80,000[c]	2008[c]	Partial
Deposit Coalition.	Broome; Delaware	300[d]	37,000[d]	2008[c]	Yes
Conklin/Binghamton Coalition.	Broome	700[e]	19,000[e]	2008[c]	No
Schyuler County Coalition.	Schyuler	150[c]	10,000[c]	2009[c]	No
Tompkins County Coalition.	Tompkins	80+[c]	ND[f]	2010[c]	No
Southern Tier Landowners Coalition.	Tioga; Broome	ND[f]	ND[f]	2008[c]	No

NOTE: *Lease signed as of February 01, 2011.

SOURCES: [a]SCLC 2010; [b]TCLG 2010; [c]Interview data; [d]Wilber 2008; [e]BCLC 2010; [f]This information has not been publically disclosed

Many landowner coalitions were on the verge of signing leases with energy companies before the state environmental review and the recent economic decline. As of early 2011, most have not yet signed group leases. This is attributed primarily to the decrease in leasing interest, which is expected to be temporary. Much of the groups' strategy and true negotiating leverage has yet to be tested, although a few

of the coalitions in New York have lucrative leases. It is widely expected that once drilling is again allowed, leasing activity in New York will strongly rebound.

Membership in the coalitions is clearly reserved to property owners. However, many coalitions currently have outreach efforts to the broader community. Coalitions organize or sponsor educational seminars that are open to the public on topics ranging from geology to forestry practices to financial literacy presented by a range of municipal, state, academic, and energy company representatives. Dozens of such sessions have been organized by landowner coalitions and serve as among the most influential and comprehensive sources of education on Marcellus Shale-related topics in communities throughout the Southern Tier. Coalition leaders have often become community leaders that interact regularly with local politicians and officials.

Political Advocacy

Another significant development is the recent creation of a statewide umbrella group called the Joint Landowners Coalition of New York that includes the leaders of many individual coalitions, created to share leasing information and negotiation strategies, and for lobbying and advocacy at the state and federal government levels. The group's mission statement reads: "To foster, promote, advance and protect the common interest of the people as it pertains to natural gas development through education and best environmental practices" (JLCNY 2010). While this group will not be signing leases for the totality of coalition acreages, it does serve to aggregate existing human, political, and social capital resources and improve the relative position of these groups. Lobbying and political outreach activities among the coalitions have increased with the environmental review process: blue and green yard signs that read "Friends of Natural Gas NY" have been distributed across the Southern Tier by landowner coalitions, and some groups have helped to organize public demonstrations with a coordinated message of "Pass Responsible Gas Drilling" (which is often memorably summarized with the slogan "Pass Gas"). There are members of the coalitions who have publicly avowed critical views of federal or state government regulation. However, most coalitions appear – at least publically – to favor non-confrontational rhetoric when advocating for the issuance

of drilling permits.[2] Further, the central focus and organizing force behind the coalitions appears to remain related to collective lease negotiation.

The Timing of Group Formation

When questioned about the time line of the emergence of landowner coalitions in southern New York State, eight of the interview subjects pointed toward a series of educational presentations held by a handful of agricultural and extension educators during a period between late 2007 and mid-2008, a time when energy company representatives (or landmen) began to aggressively approach landowners to sign energy leases. The purpose of those meetings was to offer information on the leasing process, the process of drilling a natural gas well, and strategies for individually negotiating a natural gas lease. Two organizers said they had been aware of a few small-scale coalitions forming among landowners in Pennsylvania, while others said the rationale to act collectively occurred spontaneously.

One educator interviewed for this study recalled,

> We did a meeting down in Delaware County, and a meeting up in Broome County, after getting some calls about landmen showing up.…It took a while to realize that you could negotiate and that all your leverage for the most part is your base of property.…It was more of a spontaneous thing. I'm trying to think if the word coalition was even used. It was just the idea of working in groups, with your direct neighbors, just for leverage in negotiations. (Emerson)

It was out of these educational meetings that at least three landowner coalitions were formed in the eastern end of the Southern Tier. In May of 2008, the Deposit, NY coalition, comprised of about 300 landowners owning some 30,700 acres of land in Broome and Delaware Counties, used their leverage to sign a 5-year lease with XTO Energy for $2,411 per acre and a 15-percent royalty. By comparison, the highest rate offered to individual landowners in that area at the time was approximately $750 per acre and a 12.5-percent royalty, with most landowners receiving much less (Wilber 2008). Many farmers in the Deposit area were literally made millionaires overnight, and news of the deal spread.

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[2] As an example, a recent fund-raising letter from the president of the Joint Landowners Coalition summarized the group's advocacy efforts: "We're the *only* statewide organization that is reaching out to educate people and politicians about the benefits of gas and how it can be safely and responsibly developed" (JLCNY 2011:1, emphasis in original).

Motivations for Membership

It emerged from the interviews that financial incentive for members represented the primary motivation among both members and organizers. This motive was especially strong at the early stages of organization. A coalition organizer from an area several counties away from the Deposit coalition recalled,

> Here was a whole bunch of people, landowners, that were being offered $50-75 an acre, but you started seeing $2500 an acre with the coalitions. And so I thought, 'Whoa, that's pretty significant.' That's how I got involved.…I saw that, gee, this didn't make any sense that the gas companies were not offering fair and equitable prices. So [in] June 2008, I went out to [the local] firehouse and gave a little presentation to some people out there [about starting a coalition]. (Hume)

Another organizer from a different coalition recalled,

> I had saw a flier down at a tractor supply store that was announcing an informational workshop down at the [town] auditorium. And by this time, I believe the Deposit coalition, I think it was, had signed. So this was when things really started getting heated up so it was really becoming the idea that if land owners joined together, they could get a better deal.…And there were quite a few people in that auditorium that night; there was probably a couple hundred. And it was kind of, "Hey, I think we ought to get together." (Dell)

Soon thereafter, however, the combination of the update to the GEIS and economic decline halted much of the leasing activity. Five of the interviewees indicated that during this time, members expanded their motivations for collective action to include the protection of private property and environmental protection. One organizer noted,

> So in the beginning it may have started as, "Let's band together for increased bargaining power." But as it evolved, it became more of "Let's become knowledgeable. Let's work together as a group. Let's keep our resources intact. Let's keep our environment intact. Let's make sure the water is safe." So it switched to a much more comprehensive purpose. (Murphy)

Another organizer added, "You can almost put money as number two, now. The biggest thing is the protection of private assets and private property, and just the knowledge. Not being taken advantage of and protecting yourself." (Emerson)

An Emerging Emphasis on Property and Environmental Protection

The environmental protections negotiated by landowner coalitions have the potential to influence natural resource management across vast acreages of New York and thus the environmental public goods over what might occur if the leases were negotiated separately. The leases signed with some coalitions require environmental protections above those required by the New York State DEC (Department of Environmental Conservation) regulations – such as additional water testing; additional buffers from streams, wetlands, or structures; and more stringent reclamation practices – and other coalitions have since investigated additional management strategies that not only go beyond what is required by DEC but include development practices more specifically tailored to the local environment.

> The DEC is going to have environmental regulations that will be a minimum requirement. The lease that our groups have created is going to be more restrictive and much more protective of the environment than anything the DEC is doing….because the lease is a legal contract, the gas companies are not going to have the option to choose less stringent environmental regulations. If you acknowledge that drilling is going to happen at some point, the reality is that there will be more environmental protection by landowners getting involved in a coalition, because you have more power to write a more stringent lease. (Dell)

A representative of the Deposit Coalition noted that property and environmental protections included in their lease were critical to the members.

> We have in there that, for example, there's distances that they have to stay away from all buildings, I think it's a 500-ft additional buffer. They have to come in and they have to check all the water systems within that area, it's got to be tested before they drill. So if there's any way that these water supplies are harmed in any way, they're going to have to be prepared to fix it. (Newcombe)

Future Roles: "Rolling" Coalitions? Environmental Monitoring?

When asked to predict how the coalitions would operate or expand in the future, especially after a lease is signed, three organizers cited the current mosaic of leased and un-leased properties as a constant source of new members as leases expire in the future.

> We organized in the form of what we call a rolling coalition. We actually have right now about 75,000 acres that is ready to be released. "Open acreage," we call it. Within the next year there will be an additional 8 or 10 thousand acres that the leases will run out on, and so on. So this will be a rolling, or constant coalition and we don't foresee any predetermined time when we would end. (Noble)

When asked if they envisioned that the coalitions would help landowners monitor drilling activities for environmental or other lease violations, all of the organizers expected that the coalitions could do so, with scenarios ranging from the issuance of monitoring guidelines to *pro bono* legal assistance. However, one organizer floated within his or her coalition the idea of setting aside funds for long-term legal assistance, but it was deemed too complicated.

> [We had the idea that] landowners put 3 percent back into a trust for the group so that should future legal expenses arise, that that trust would be there. But who manages it? How long does it last? Where does the money go when it's done? And most importantly, your landowners don't want to spend 3 percent of their money because right now it's not a problem.…So not to say that it couldn't be done, but the landowners would have to fund those trusts and manage them and your landowners are not going to be willing to give up that money. (Jones)

However, even lacking a legal trust, the collective power of the landowner coalitions to fight lease violations has already been demonstrated. For example, letter-writing campaigns and lobbying efforts organized by the coalitions have resulted in punitive actions by the New York State Attorney General against energy companies for violating existing lease agreements with coalition members (Wilber 2009). Besides lobbying state regulators, the coalitions distributed information to their members on which common leasing violations to watch for, cataloged reported violations, and provided legal advice on how to best respond to

the violations. Upon the announcement of a widely-publicized legal settlement with an energy company, a coalition representative was quoted in the newspaper as stating "[T]his lets landowners know it is not a David-and-Goliath fight. It lets gas companies know they will be watched, and they have to follow the same code of ethics everybody else does" (Wilber 2009:1).

Membership and Benefits to Community

Coalition members were asked to explain whether and how the broader community might benefit from the coalitions, and how communities might potentially work with the coalitions to achieve benefits. Most respondents indicated that they believe these communities will most certainly receive indirect benefits of more local income and the cumulative environmental effect of better property protections. However, the avenue by which communities or municipalities could receive direct benefit was not well established. It appears that little is currently being done to concretely address this aspect, suggesting that this element is being recognized but remains yet-underdeveloped.

> When the leasing boom first appeared in spring of 2008, everybody's immediate focus was on compensation. And nearly a year later other concerns such as all the social and economic and the environmental and legal issues kind of started to enter in to most landowners' consciousness. So we weren't just gonna be about giving better deals for our landowners, and monitoring terms but we are looking to protect landowners and even the non-leasor community members . . . trying to maximize capital on a lot of the good things that could come from natural gas development, and minimize the bad things. (Murphy)

Another coalition leader stated,

> I don't think [negotiating benefits for the larger community are] being contemplated yet by the landowner coalitions because the landowner coalitions are made up entirely of private land owners.…The next logical step in my opinion is for these [local government advisory] energy taskforces that are also emerging across the Southern Tier should begin to work together with landowner coalitions. The landowner coalitions would certainly have the leverage and I think that's where an energy taskforce could provide valuable recommendations to a landowner coalition and to

say, "Let's try and get some of these additional things that are very common in large scale energy projects." If one little town is asking for a new playground, it just depends how important that little town is. But if you've got the whole county saying, "You ain't doing business in our community…unless…", it sounds a little bit like blackmailing, but there's going to be significant externalities that affect the whole community, so beyond the tax assessment benefits and things that supposedly trickle down and help the whole community, to me it seems very reasonable that if there is going to be any kind of gas drilling in our community that there's some benefits done that compensate the whole community. (Carruthers)

Another coalition leader also mentioned impact mitigation techniques used in other areas.

Government doesn't typically lead the way that people think it does. Most good ideas are going to come from another source, and it's going to be landowner coalitions who are going to be the ones that are going to show the state, the feds in some instances, what should or shouldn't be done. People always go to town meetings and say they want the truck traffic to diminish and the town can do very little about it – and this is even without any gas drilling. I know there are pipeline systems that have been put into place in heavily developed gas plays that pipe water in right next to the pipelines that pipe the gas and this cuts down all the truck traffic. This is absolutely something we could try [to negotiate]. We have these ideas- we have been looking at development in Norway, and we know how it can be done and we are looking at this in a global way. If the town, if the county…once these problems and opportunities come we can begin to brainstorm. (Francis)

One coalition organizer was less optimistic.

As far as working with the municipalities: as the landowner, do you want to sit there and wait for the municipality to get what it wants? Landowners are not going to sit there and wait. Most landowners you would like to think are community-oriented, but how often do you think about the shape and condition that your town's fire truck is in until you need it? (Jones)

Another coalition leader, while sympathetic, thought that negotiating for the public at large was not pragmatic.

> There is a pretty large universe of stakeholders that have greater and smaller legitimate interests about how the development of the gas resource is done. The process by which their interest is recognized and dealt with is a pretty huge process, and I don't think it would be fair to say that it is up to a coalition to try to identify the whole world of stakeholders out there and legitimate interests. I think this is a process that to some degree people are going to have to speak up for themselves and there is some of this going on right now. (Martin)

A leader very optimistic toward working with local government still admitted that members will invariably have the most control over the organization:

> Landowners are definitely going to be benevolent dictators in this process. There is no doubt in my mind. Especially the large landowners, which in this area is the farm community. Now whether they are mean or benevolent in how they go about it is a different story. But to vilify landowners for being interested in this is a grave error, because landowners are the folks that will make this a successful process or not. (Francis)

Another leader was more optimistic.

> You got to be aware that there is impact to the community. There's positive impact with jobs, income, the turnover of income, the additional people, all of that. But then someone is going to have to take responsibility for the infrastructure, the roads, that kind of thing.…I think whichever municipality that has the acreage, the coalition would be a partner with the municipalities. What would be a good thing is that if we have communication, an open link, and that we understand the impact to the local community. (Hume)

A coalition leader explained that the groups can still do good things for the community outside the lease negotiation process.

> We have a situation [nearby] where several wind turbines are being proposed – they are trying to get venture capital together to finance the construction. I have suggested to the wind developer that he approach these landowner coalitions and make this pitch. If the plan is sound enough and good enough, people as a group will invest in it – not because it is wind, but because it is local, it's energy, and it is a sound business idea. (Francis)

While to some extent the coalitions currently seek the collective management of natural resources for the common good, the limit of that "commons" seems (for now) to be bounded by the property boundaries of coalition members. The groups are, however, building collective capacity by pooling information, skills, and other forms of human capital that, before the consolidation, have been widely dispersed across individual landowners, and they attempt to apply this to the management of natural resources. Furthermore, they attempt to wrest the power away from the centralized and non-local structures of the energy developer. In these elements, there are some nascent impulses toward community outcomes.

SUMMARY AND DISCUSSION

Our paper has introduced the emergence and activities of the landowner coalitions that have formed in the Southern Tier of New York State in response to exploration of the natural gas resources of the Marcellus Shale, and we have partially situated this phenomenon against other types of collective natural resource management by analyzing the provision of member versus public benefits. These coalitions have formed rapidly, have many members, and now influence a large portion of the drillable landscape in the region. They have heretofore been motivated by factors consistent with a cooperative framework, as they have emphasized the securing of private, excludable, financial, environmental, and property rights benefits for members. Barton (1989:1), in his introduction to the cooperative model, noted that cooperatives in the United States are fundamentally private organizations operating in a capitalistic private enterprise system, whereby "benefits of the cooperative are distributed to its [members] on the basis of their use." The interviews with landowner coalition organizers show that the coalitions in New York State are organized and managed in much the same way, with a primary focus of maximizing the financial benefits from capitalistic enterprise to its members, with an economic return based on the property contributed. Coalitions that have signed collectively-negotiated leases have clearly demonstrated the

economic value of doing so, and a clear and rational economic incentive for membership exists.

Our interviews, however, also reveal that these coalitions are engaged in discussions and strategies that may someday lead to the potential provision of public benefits, either indirectly though the cumulative impact of member property protections across landscape scales, or directly though large scale mitigation strategies in realms such as waste disposal, community development, and structured local economic investment.

The ecological, health, and land use protections – which thus far have included items such as water testing, setback restrictions from waterways and built structures, and reclamation protocols – negotiated for coalition members are private goods at the individual level, but at the aggregate level they can become public goods with implications for regional well-being. Interview data show that coalition leaders are thinking about these benefits similarly: individual benefits are foremost, but the larger cumulative effects on public benefits are also kept in mind.

Regarding the potential for reducing ecological damage, and in comparison to a scenario of individually-negotiated leases such as is occurring in neighboring states, the coalitions offer several opportunities for ecological benefits. First, ecological benefit may take the form of individual landowners' greater ability to dictate the terms of unwanted land uses (e.g., the placement of roads away from sensitive areas, reduction of permanent structures, materials handling and disposal stipulations) and wanted land actions (e.g., reclamation protocols, reforesting practices). Second, although these negotiations are conducted for individual coalition members, the sheer scale of land controlled ensures that some modicum of protection for relatively large blocks of rural landscape may result. Many members of the community will presumably benefit from the protection of large blocks of landscape, in both protection of cross-boundary ecosystems and other natural resources, and protection of landscape-based community attributes. An important component of this protection may take the form of ecological monitoring, either through a legal trust or, more likely, through collective sharing of information and lobbying (as has already occurred regarding other leasing violations). A third, and thus far entirely hypothetical, possibility for ecological benefit is the negotiation of common benefits by the landowner coalitions for the larger community.

While this latter type of negotiation is just beginning to be considered by coalition leaders, without municipal or regional governments' ability to conduct effective negotiations, the coalitions may represent the best and only option for this

third scenario to unfold. Such a negotiation would presumably be much more difficult, and it will be interesting to see whether coalition leaders and members are ultimately willing to shoulder the burden to promote general well-being on a larger scale. Research in other energy development areas has shown that, in general, people show more concern with negative impacts as experience with energy development increases (Anderson and Theodori 2009; Thompson and Blevins 1983). Likewise, experience with gas drilling in the Southern Tier may precipitate coalition activity toward larger concerns.

Thus far these groups have also not yet engaged the larger socioeconomic well-being of the community, although there are clearly benefits to the community in the form of increased compensation flowing through the local economy, especially when alternative drilling scenarios are considered. Yet a prime concern about Marcellus shale drilling involves the exacerbation of existing inequality: those with favorable leasing terms stand to reap great financial gain when socioeconomic and municipal infrastructure is stressed, a condition that has traditionally resulted in some members of resource dependent communities being made worse off (Jacquet 2009). A criticism sometimes leveled at the landowner coalitions is that they stand to benefit by degrading the quality of life of non-land owners, yet local communities now have a greater, if largely untested, potential to manage the development of these resources than was previously available, especially if the alternative scenario is widespread drilling that is individually negotiated. Interestingly, benefits from collective organization may also flow to energy companies, as the coalitions offer the companies lowered transaction costs through one-stop shopping; still, how these lowered costs compare with coalition leasing terms that include vastly increased rates of compensation and an array of additional demands seems unknown amongst all parties.

Even in the wider multi-state Marcellus Shale policy arena that includes academics and state regulators, socioeconomic impacts and community controls are only just beginning to be discussed (Jacquet and Stedman 2009; Kenneally and Mathes 2010). It may be unrealistic for coalitions to be "leading the pack" in this realm, and their acts of collective action toward leasing negotiations still represent some progressive changes to the organization and regulation of natural gas development in the Marcellus Shale.

CONCLUSION

This study is limited in that it is focused on the experiences and opinions of coalition leaders; a great deal of research opportunity exists to measure the

attitudes of rank-and-file members and analyze the groups' true capacity as they begin to negotiate with energy companies. Nonetheless, the landowner coalitions described here – especially given their impressive sizes and strength – have demonstrated the value of working together and have gained sometimes substantial increases in compensation, property-level environmental protections, and legal power acquired for their members.

Substantially increased leasing bonuses and royalty rates for thousands of landowners will undoubtedly create indirect benefits for local economies, and the impact of thousands of parcel-scale ecological protections can have a positive cumulative effect on public ecosystem services and amenities – especially when compared with a similar amount of gas development occurring on individually-negotiated properties.

It remains to be seen if the size and strength of the coalitions – combined with a vacuum of municipal authority – will allow the groups to transcend localized collective action and move toward the provision of public goods as more consistent with a public-benefits framework such as CBRM. Much of the coalitions' potential in this regard is yet unrealized; however, the coalitions have demonstrated an ability to expand the incentives of membership to engage non-monetary and ecological benefits.

It remains to be seen how the wider coalition strategy (and the patience of coalition members) will fare during protracted negotiations with energy companies. Yet the collective action of individual landowners in New York State has shown promise as an effective management tool for the extraction of natural gas and other types of energy development taking hold across vast areas of small-acre parcels in the United States.

AUTHOR BIOGRAPHIES

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