UNIVERSITY OF OKLAHOMA

GRADUATE COLEGE

‘WHEN THE WIND COMES RIGHT BEHIND THE’ … SALES PITCH: ALTERNATIVE VIEWS TO WIND ENERGY DEVELOPMENT IN A RURAL OKLAHOMA HOST COMMUNITY

A THESIS

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

Degree of

MASTER OF SCIENCE

By

TANYA S. WOODY
Norman, Oklahoma
2020

Downloaded from SHAREOK. Persistent Handle URL: https://hdl.handle.net/11244/326606

‘WHEN THE WIND COMES RIGHT BEHIND THE’ … SALES PITCH: ALTERNATIVE VIEWS TO WIND ENERGY DEVELOPMENT IN A RURAL OKLAHOMA HOST COMMUNITY

A THESIS APPROVED FOR THE
DEPARTMENT OF GEOGRAPHY AND ENVIRONMENTAL SUSTAINABILITY

APPROVED BY THE COMMITTEE
CONSISTING OF:

Dr. Jeffrey Widener, Chair

Dr. Scott Greene

Dr. Travis Gliedt

© Copyright by TANYA S. WOODY 2020
All Rights Reserved.

ABSTRACT

‘WHEN THE WIND COMES RIGHT BEHIND THE’ … SALES PITCH: ALTERNATIVE VIEWS TO WIND ENERGY DEVELOPMENT IN A RURAL OKLAHOMA HOST COMMUNITY

By Tanya S. Woody

Wind energy development has expanded across the prairie of northwest Oklahoma over the past 17 years. Several factors contributed to the success of wind energy in the state including a volatile economy history spurring a need to diversify the energy-based economy, ideal wind power potential, and state and host community support fueled by a rural benefit narrative. Starting in the early 2000s, the state and rural oil and gas communities familiar with the hardships of volatile fuel markets embraced wind projects as a means to strengthen their local economies and ameliorate rural disadvantages. Literature on the impacts and perceptions of wind energy benefits for host communities, however, remains divided, and little is known about realistic effects and perceptions in the context of a pre-existing energy culture and economy. The overarching objective of this thesis is to better understand the local-level impacts and perceptions of wind energy development using a case study of the rural, host community of Woodward, Oklahoma, where oil and gas ties run deep compared renewable energy. Stakeholder interviews, follow-up research including additional interviews and published material, and field observations offer a narrative of local experiences that are at odds with rural benefit narratives. The most notable aspect of the findings of this study is the overall negative or doubtful perceptions of local wind energy development, with interviewees

citing that economic benefits have not materialized for them as anticipated. The study reveals perceptions and expectations are multidimensional in nature, informed by place-based experiences relating to pre-existing energy culture, tax issues, distributional fairness, and familiarity with wind industry practices. Results show concerns about tax issues to be strong indicator of negative perceptions toward the wind industry, with interviewees not opposed to wind energy, in general, but to post-construction wind industry behavior and perceived unfairness of the outcomes. Results of this thesis have implications for future state and local policies to renegotiate terms of renewable energy investment, specifically to hold the wind industry more accountable for social, economic, and environmental impacts of their projects. Themes uncovered here also provide evidence that investigating perceptions and impacts of wind energy in the context of pre-existing energy culture have much to offer researchers.

ACKNOWLEDGMENTS

I would like to thank my committee chair and advisor, Dr. Jeffrey Widener, for his guidance, support, and patience during this study. Thank you for your time, energy, and insight. I would also like to thank Dr. Scott Greene and Dr. Travis Gliedt for their counsel, contributions towards this achievement, for serving on my graduate committee, and for their time spent reviewing this work. I am grateful to my family and friends for their endless support and for always pushing me to keep going.

TABLE OF CONTENTS

ABSTRACT iv

ACKNOWLEDGMENTS vi

LIST OF TABLES x

LIST OF FIGURES xi

CHAPTER 1: INTRODUCTION 1

CHAPTER 2: LITERATURE REVIEW 16

2.1 Economic Impacts 16

2.1.1 Property Value 22

2.2 Environmental Impacts 25

2.2.1 Environmental Benefits 25

Emission Savings 25

Water Conservation 26

Landscape Use and Degradation 27

2.2.2 Negative Environmental Impacts 27

Wildlife Impacts: Birds and Bats 29

Human Impacts: Noise, Flicker Effect, Human Health, Aesthetics 34

Noise and Flicker Effect Impacts 34

Visual Impacts 37

2.3 Public Perception 38

2.3.1 NIMBYism 39
Physical Proximity 40
Stages of Acceptance 41
Theoretical Debate 43
2.3.2 Place-Attachment 45
2.3.3 Trust 47
2.3.4 Fairness Frameworks 47
2.3.5 Expectations 50
2.3.6 Socioeconomic Factors: Rural Northeast, Midwest, and Great Plains Case Studies 51
2.3.7 Oklahoma-Based Studies 53
2.4 GOALS AND OBJECTIVES 58
CHAPTER 3: METHODOLOGY 60
3.1 Study Location: Brief History of Woodward, Oklahoma 64
3.2 Methods 71
3.2.1 Research and Interview Question Design 71
3.2.2 Sampling Technique and Interview Process 76
3.2.3 Follow-up Research 82
3.2.4 Field Observations 84
3.2.5 Thematic Content Analysis 88
CHAPTER 4: RESULTS 91
4.1 Field Observations and Interviews 91

4.2 Presence in the Community 95

4.3 Economic Instability: Boom and Bust Cycles of Wind 100

4.4 Where the Wind Blows: Uneven Local Benefits and Tax Avoidance Schemes 104

4.5 Threats to Native Wildlife and Livelihoods: Green-on-Green Contradiction 111

CHAPTER 5: DISCUSSION AND CONCLUSION 116

5.1 Expectations 118

5.1.1 Expectations from Wind Sales Pitch and Unrealized Economic Promises 119

5.1.2 Place Identity and Expectations: Comparing Wind and Oil 124

5.2 Public Response as Residuals of Industry Motives 128

5.3 Green-on-Green Collision and Prairie Lifestyle 134

5.4 Missing Themes 139

5.5 Limitations 142

5.6 Conclusion 145

REFERENCES 150

LIST OF TABLES

Table 1. Oklahoma wind farms constructed 2003 to 2009 5

Table 2. EIA National Ranking of Natural Gas and Crude Oil Production by State (Top 10) 10

Table 3. Summary of several case studies on socioeconomic factors and public support for wind energy in rural Northeast, Midwest, and Great Plains 56

Table 4. Study participants 82

LIST OF FIGURES

Figure 1. Wind energy development across Oklahoma 2001 to 2020 2

Figure 2. Oklahoma Wind Power Potential Map 3

Figure 3. Oklahoma Annual Wind Power Capacity and Generation 2005 to 2019 12

Figure 4. Lesser-Prairie Chicken Habitat and Wind Energy Development in Western Oklahoma 32

Figure 5. U-support curve of local wind energy acceptance 42

Figure 6. Wind turbine development around Woodward from 2001 to 2018 67

Figure 7. Excerpt from the Woodward Industrial Foundation's wind power brochure ... 71

Figure 8. Interview questions for business owners 74

Figure 9. Interview questions for government officials and community leaders 75

Figure 10. OU Spirit Wind Farm, Woodward, Oklahoma 91

Figure 11. Photo of wind turbine displayed in the Northwest Inn lobby 93

Figure 12. Oil on canvas painting by artist Larry K. Hill 93

Figure 13. Two types of place-based expectations from findings 119

Figure 14. Current Lesser Prairie-Chicken Range and Energy Extraction Activity in Northwest Oklahoma 137

CHAPTER 1: INTRODUCTION

Since the early 2000s, commercial-scale wind energy development has blossomed on the prairie grasslands of western Oklahoma. Oklahoma Wind LLC and Blue Canyon wind farms in Harper, Caddo, and Woodward Counties came online in 2003 (NextEra Energy Resources 2019; White 2016). Since then, fifty-nine more wind farms have come online (USWTDB 2020). And as of January 2020, nearly 4,000 private and commercial-scale wind turbines dot Oklahoma's rural landscape (see Figure 1; Hoen et al. 2020).

Oklahoma ranked third (circa October 2019) in the nation for wind power capacity with 8,072 Megawatts (MW) of installed wind generation capacity and over $14 billion in capital investment (AWEA 2019; US DOE 2019). Nearly 32-percent of the electric grid mix in Oklahoma is powered by wind (US EIA 2019a). According to the American Wind Energy Association (AWEA), wind energy development in Oklahoma supports economic development, $1.2 billion in cost savings for energy consumers, and $23.5 million in state and local tax revenue (AWEA 2019). AWEA (2019) also suggests the wind industry paid roughly $20 to $30 million in lease payments to landowners hosting turbines in 2018.

Much of the current onshore wind power development in the U.S. exists in the Great Plains region, often called the "Saudi Arabia of Wind Energy" (Martin and Ramsey 2009; Righter 1996). The region boasts high wind power potential for energy production, ranging from 'fair' to 'excellent,' according to the national wind resource map produced by the National Renewable Energy Laboratory (NREL 2019; Figure 2). These conditions,

together with its relatively rural and flat terrain, make the region ideal for wind energy production.

Figure 1. Wind energy development across Oklahoma 2001 to 2020

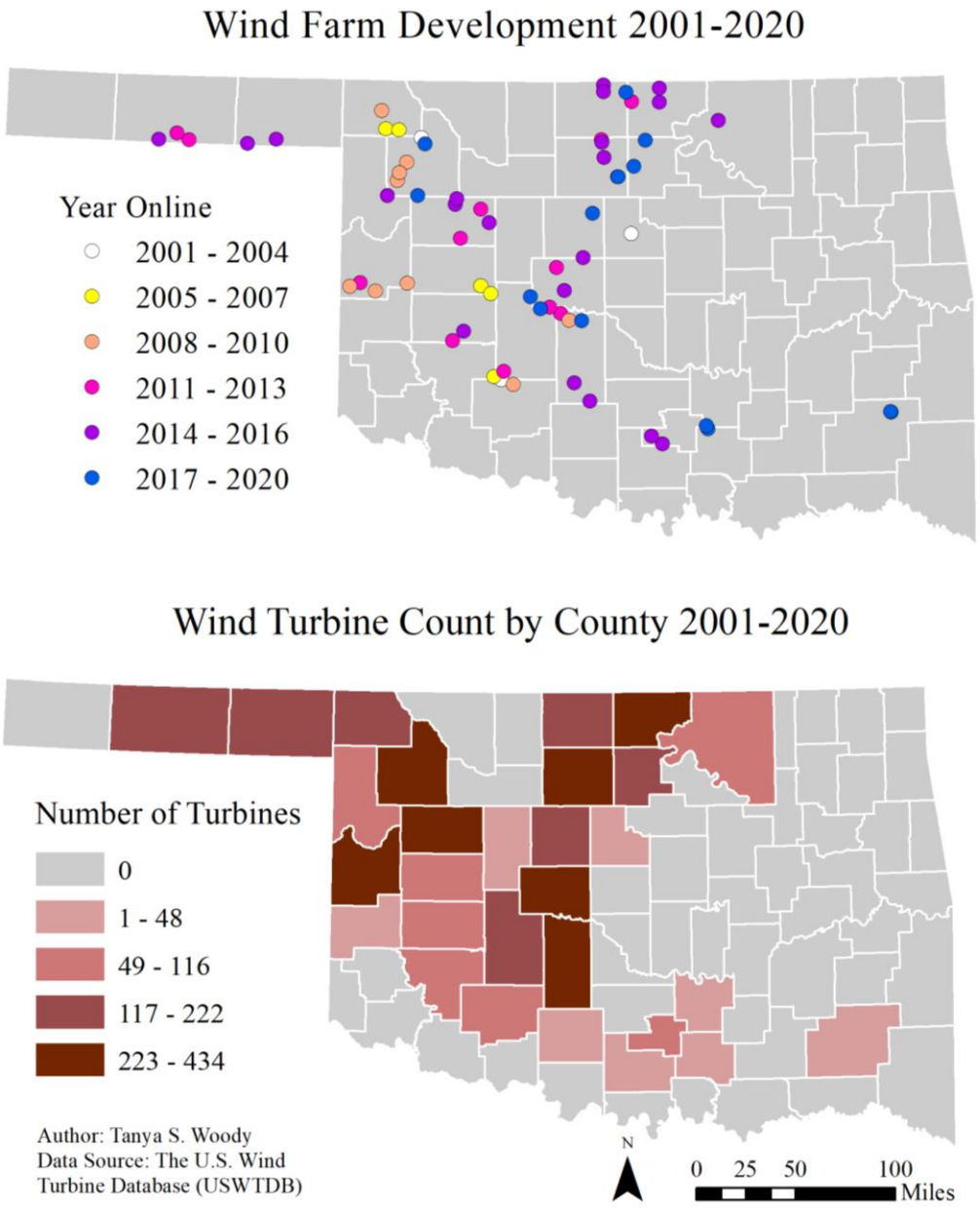
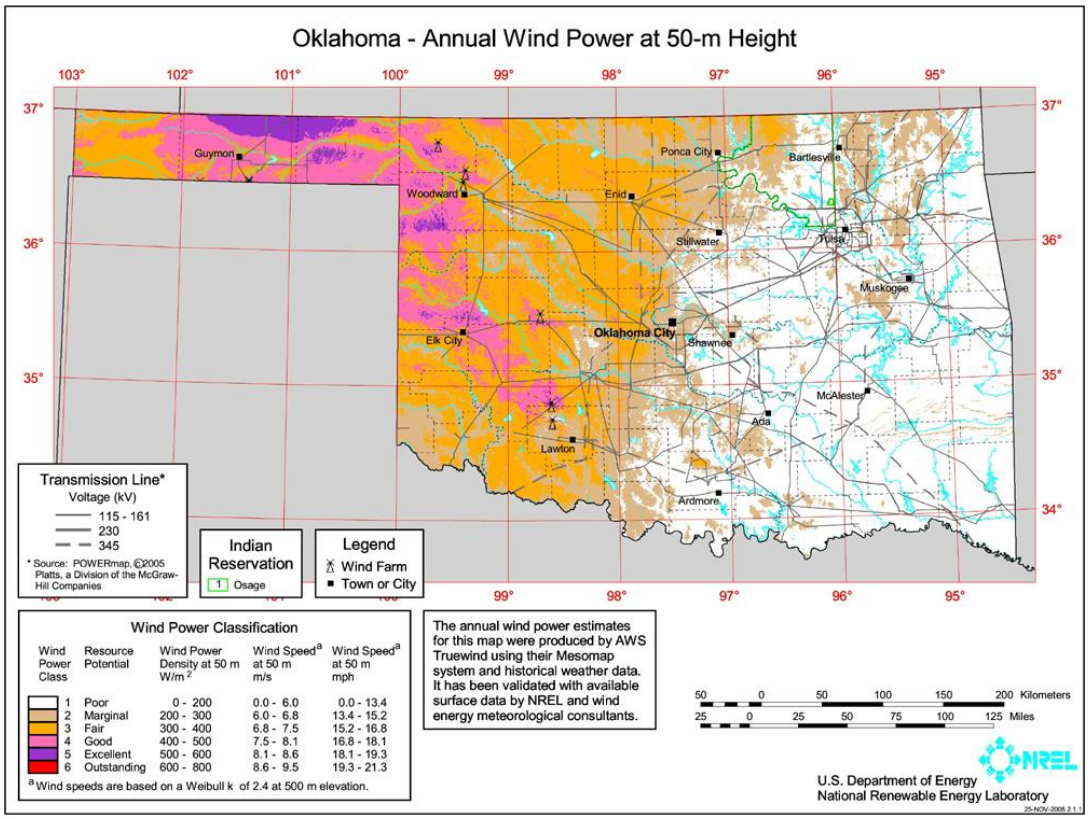


Figure 2. Oklahoma Wind Power Potential Map



Source: windexchange.energy.gov

While Oklahoma is well-known for having excellent wind energy potential, several factors contributed to the rapid spread of wind power here, including political, socioeconomic, and host community support. Following the oil bust of the early 1980s, state voters approved State Question 588 in 1985, creating a five-year ad valorem manufacturing exemption from property taxes for qualified manufacturing and research and development facilities. The goal of this bill was quite simple—to attract new industry to the state (OKPolicy 2019). Certain wind power companies qualified for this exemption; however, wind industry interest in Oklahoma lagged until the early 2000s

(Meo 2006). That is, until several wind energy advocacy groups and academic research collaboration, including the Oklahoma Wind Power Initiative (OWPI), U.S. Department of Energy's Wind Powering America (WPA), the Oklahoma Renewable Energy Council (OREC), and the Oklahoma Renewable Energy Foundation (OREF), led a series of successful campaigns and workshops that motivated state policy makers (Meo 2006). As a result, state legislators passed several pieces of legislation to attract wind energy development (Meo 2006).

In 2001, Governor Frank Keating (1995 to 2003) signed a bill providing financial support for wind investors by granting eligible renewable energy resources a ten-year zero-emission production tax credit (DSIRE 2019). This was followed by the construction of eleven wind farms from 2003 to 2009 (Table 1). In 2009, senate bill 827 continued to show state legislative support for the expansion of wind energy by promoting the development of transmission lines (Oklahoma State Senate 2009). Then, in 2010, the state set a goal to produce 15-percent of its power from renewables by 2015 (Ferrell and Conaway 2015). These, other initiatives, and financial incentives[1], coupled with the decreased cost of and improved efficiency of wind power technology, continued to attract private wind energy development to the state. Still, strong local opposition

[1] A vital part of wind power development is the power purchase agreement (PPA) or the long-term contract between the wind farm owner and the energy purchaser. Energy purchasers range from corporate to traditional utility companies. For instance, the Great Western Wind Project consists of 30 V117 wind turbines with 3.3 MW power capacity and 51 V100 turbines with 2.2 MW capacity. The wind farm entered into a power purchase agreement with Google to power Google's new data center in Mayes County, Oklahoma (White 2016). The project is expected to generate more than $25 million in property taxes for the two counties. Oklahoma Wind Energy Center entered a 20-year power purchase agreement with Oklahoma Gas and Electric Company (OG&E) (White 2016). Half of the power generated from the wind farm is sold to OG&E, and the other half is sold to Oklahoma Municipal Power Authority.

among host communities can slow the development of wind energy projects (Bidwell 2013).

Table 1. Oklahoma wind farm characteristics for those constructed 2003 to 2009

Project Name	County	MW	Date of Operation
Oklahoma Wind LLC	Harper, Woodward	102.0	2003
Blue Canyon	Caddo, Comanche	74.0	2003
Blue Canyon II	Caddo, Comanche	150.0	2005
Weatherford	Custer, Washita	147.0	2005
Centennial Wind Farm	Harper	120.0	2006
Sleeping Bear	Harper	94.5	2007
Buffalo Bear	Harper	19.0	2008
Red Hills Wind	Roger Mills, Custer	123.0	2009
Blue Canyon V	Caddo, Comanche	99.0	2009
OU Spirit Windfarm	Woodward	101.2	2009
Elk City I	Roger Mills, Beckham	98.9	2009

Source: *Table adopted from White 2016; Ferrell and Conaway 2015*

Indeed, negative host community response to wind power infrastructure is an obstacle for forward momentum of renewable energy (Fast and Mabee 2015). As part of pre-development strategies to reduce public opposition and streamline deployment, developers and industry advocates highlight the economic advantages of the industry for the state and its host communities. The industry has claimed (and continues to advertise) economic benefits including local employment creation, lease payments to landowners,

tax revenue to support local schools, and community spending and investment (e.g., Blue Canyon Wind Farm 2019; Competitive Power Ventures 2019; NextEra Energy Resources 2019). Blue Canyon Wind Farm, for example, promotes "significant economic benefits to the community in the form of payments to landowners, local spending, and annual community investment" (Blue Canyon Wind Farm 2019). Likewise, Competitive Power Ventures (CPV), out of Silver Spring, Maryland and owner of Keenan II Wind Farm in Woodward, advertises its dedication to building a partnership with host communities while they work to "stabilize and improve local and state economies" (Competitive Power Ventures 2019). The AWEA similarly states that U.S. wind power "drives unmatched economic development into rural America" by delivering stable income, helping small-town schools, and keeping local taxes as well as electric bills low. Likewise, the Wind Coalition, a leading wind industry advocacy organization in Oklahoma and other high wind potential states, proclaims the energy wind industry positively impacts the state and local communities through electricity savings for consumers, job creation, ad valorem taxes paid to 191 school districts, and "billions in private investment to rural areas" (Oklahoma Power Alliance 2019).

The economic growth promotional strategies serve as a powerful selling tool because the state's highest wind power potential, and subsequent wind energy development, exists in rural areas with few supporting industries. Indeed, these communities have experienced sharp economic downturns in recent decades, "suffering large losses of population and jobs" (Greene and Geisken 2013, p. 2). Renewable energy rural benefit narratives promised these economically challenged communities with the means to ameliorate rural disadvantages by strengthening and "[re-embedding] their

economies in ‘clean,’ locally available resources — to create new ‘eco-economies” (Munday et al. 2010, p. 2). Local leaders and advocacy groups, in the state and on the grassroots level, have also pushed hard for wind power development. And given Oklahoma’s wind potential and economic history, wind energy development makes sense for the state. As a result, many rural Oklahoma communities embraced wind projects. The question I seek to address, however, is how has wind energy impacted the host communities where projects have been built? Specifically, what are the social, economic, and environmental impacts, and how do they compare with the impact that the oil and gas industry has had on so many lives and communities in Oklahoma? Is the wind industry a parallel to the state’s trademark industry, or does the political, socioeconomic, and socio-cultural impacts for host communities differ?

Oil and gas has served as Oklahoma’s trademark industry for well over a century, with exploration and drilling predating statehood (Boyd 2005). In fact, the state sits on the kerogen rich Anadarko, Arkoma, and Ardmore-Marietta geological basins and associated shelves. Over the past 120 years, oil and gas developers have drilled nearly half-a-million wells across the state’s 77 counties (OGS 2019). Indeed, the industry has long been the leading economic driver in the state. Especially good periods bring oil and gas “booms” to many areas around the state, characterized by periods of prosperity affiliated with high-wage jobs, employment growth, increased rates of real personal income, and large amounts of tax revenue (Hunt 1987; Karl 2007; Snead and Barta 2002). From 1975 to 1982, global oil and natural gas prices reached record highs (DOE 2001), causing oil and gas industry employment in Oklahoma to triple from approximately 40,000 to nearly 120,000 persons (Snead and Barta 2002, p. 2). During the

height of this boom period, one in twelve employed people in Oklahoma worked in the oil patch (Snead and Barta 2002), and Oklahoma's economic growth rate exceeded the national rates in every sector with the Gross State Product (GSP) 30-percent higher than the national rate (Koh 1991). Further, the population in Oklahoma increased by nearly 600,000 people from 1970 to 1980 (U.S. Census Bureau 1996).

Indeed, Oklahoma's development and economy are inextricably tied to the ebbs and flows of the petroleum industry markets (Boyd 2006). However, like in other energy-producing states, state-wide and local oil and gas led development suffers from the "resource curse" due to market price volatility (Karl 2007). Variation in industry activities send a ripple effect through the state's economy, leading to "busts" – or periods of economic depression, instability, and uncertainty (Snead and Barta 2002). In fact, total oil and gas employment declined steadily in oil dependent states during a bust period from 1982 to 2000 (Snead and Barta 2002, p. 3). The 1982 oil bust was further accelerated by a worldwide oil prices crash in 1985-86, causing rig counts and subsequently related employment to fall by 60 percent (Brown 2015). According to the Oklahoma Department of Commerce, the bust resulted in a 50-percent drop in mining sector employment in 1986 (Oklahoma Department of Commerce 1989). Consequently, the state lost 70,000 people to outmigration from 1983 to 1988 (Oklahoma Department of Commerce 1989).

During the 1990s, Oklahoma crude oil prices remained low, below $25 per barrel (EIA 2020). Regardless of steady natural gas production levels averaging around 1,500,000 million cubic feet annually, between 1990 and 2000 oil and gas-related jobs declined annually by 3.5% (Snead and Barta 2002, p. 3). By 2000, oil and gas

employment had declined to nearly pre-1975 estimates (Snead and Barta 2002). Petroleum prices and drilling started to rebound once more in the 2000s, increasing from $24.49 per barrel in 2002 to nearly $100 per barrel in 2008 (EIA 2020). But by early 2015, oil prices and related drilling activities declined by over 50 percent (EIA 2020; Brown 2015). The oil and gas recession from 2014 through 2016, resulted in an estimated "$2.25 billion (25%) net decline in total state tax revenue," and subsequently, a loss of nearly 70,000 jobs and $30.9 billion in household income across the state (Snead and Jones 2019, p. 2).

Still, oil and gas exploration, extraction, and production remains a primary source of employment for Oklahoma, "paying nearly double the average for all industries across the state" (Snead and Barta 2002, p. 3). Even in 2000, during a bust, oil and gas related wages reached nearly $1.5 billion, placing the industry among the top five paying industries in the state (Snead and Barta 2002). Oklahoma also remains among the nation's top oil and natural gas-producing states, recently ranking fourth (August 2019 rankings) in the nation for crude oil production and third (2018 estimates) in the nation for natural gas production (Table 2; EIA 2019b).

Table 2. EIA National Ranking of Natural Gas and Crude Oil Production by State (Top 10)

State	Natural Gas Production, 2018	Rank	State	Oil Production, 2019	Rank
	Million cubic feet			*1000 barrels/day*	
Texas	7,847,102	1	Texas	5,121	1
Pennsylvania	6,210,673	2	North Dakota	1,443	2
Oklahoma	2,946,117	3	New Mexico	936	3
Louisiana	2,810,636	4	**Oklahoma**	563	4
Ohio	2,409,153	5	Colorado	520	5
Colorado	1,831,325	6	California	439	6
West Virginia	1,799,097	7	Alaska	382	7
Wyoming	1,640,264	8	Wyoming	280	8
New Mexico	1,485,142	9	Louisiana	124	9
North Dakota	705,789	10	Utah	100	10

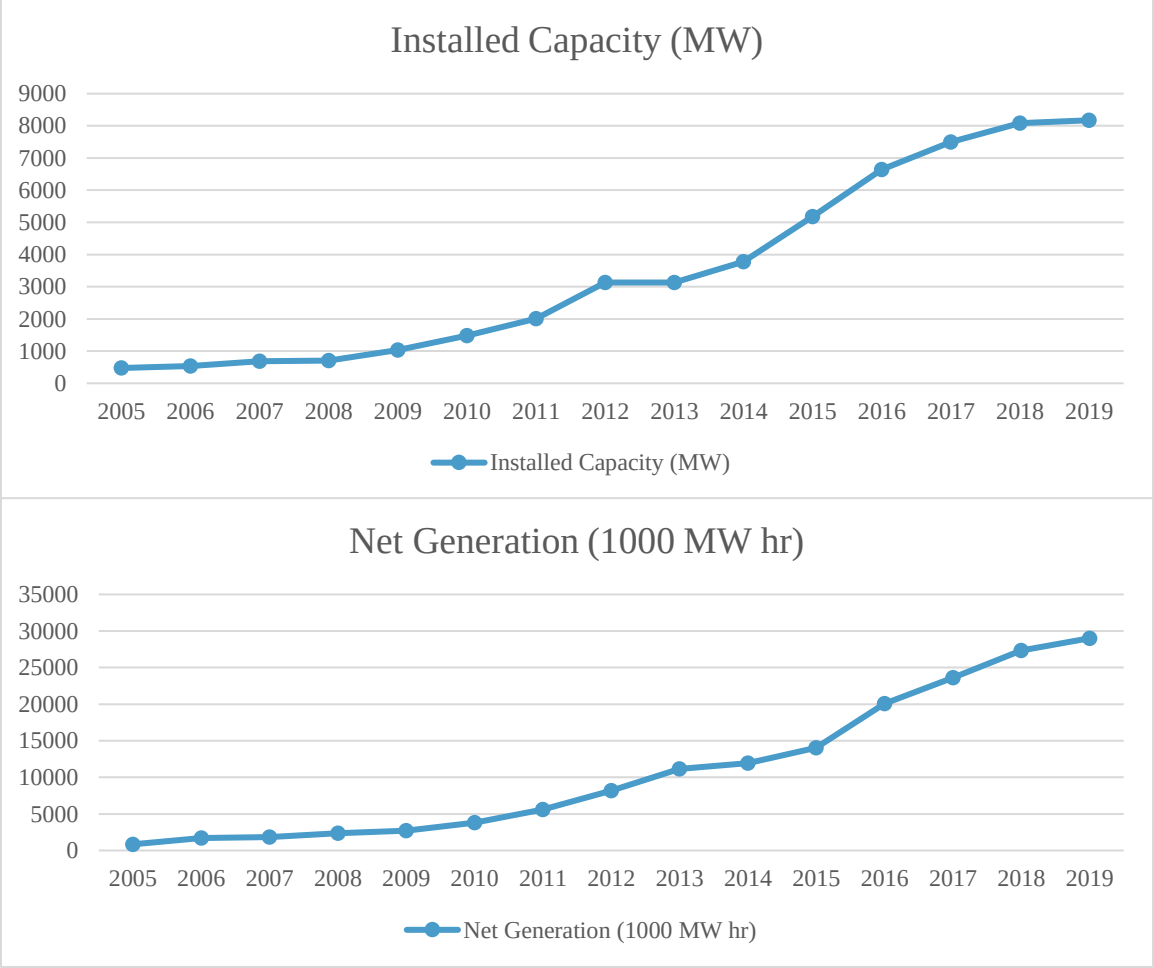
Clearly, Oklahoma's economy is inseparable from the petroleum industry. Over the past 20 years, however, the state's push to diversify its energy portfolio through the addition of wind energy is also impacting the economy and the energy landscape. In an interesting dialectic, wind farms now share the landscape once dominated by the petroleum industry. In fact, wind energy is now being harvested in oil country as part of larger global efforts to lessen the need for the petroleum industry and decarbonize the

world's energy systems (Anawar and Strezov 2018; Greene and Geisken 2013; Kammen 2006; Karunathilake et al. 2018). Since the United Nations Framework Convention on Climate Change (UNFCCC) laid the foundation for international climate agreements, over 150 countries have implemented renewable energy power policies to meet carbon-dioxide emission reduction goals (IEA 2017). While these large-scale, national efforts are important, smaller-scale aspirations are equally important in reaching proposed carbon emission reduction goals (Aslani and Wong 2014; Hess and Gentry 2019; Wiener and Koontz 2010; Wheeler 2008; Bulkeley 2013). These smaller efforts seem to characterize many of the cases in the US, which lacks a comprehensive federal regulatory framework to mitigate carbon emissions (Hess and Gentry 2019; Wheeler 2008). In fact, twenty-nine states and territories now have established specific Renewable Portfolio Standards (RPS) requiring a percentage of electricity generation by renewable resources to be reached by a specified year, and eight states have voluntary renewable energy standards, or more suggested goals (NCSL 2019). The National Conference of State Legislatures (NCSL) estimate that approximately "half of the growth in U.S. renewable energy generation since 2000 can be attributed to state renewable energy requirements" (NCSL 2019). While Oklahoma does not currently have a RPS, the state already exceeded their first voluntary renewable energy target (15% by 2015) in 2014 (Ferrell and Conaway 2015).

Among renewable energy deployment efforts, wind energy ranks as the fastest growing commercial-scale energy source both around the world and within the United States (DOE 2020a). Promising a low-carbon and long-term solution to energy needs (Makhijani 2007; Martin and Ramsey 2009), global wind installed capacity is projected to double by 2027 (Deign 2018). Although the United States still lags behind Europe and

other industrialized economies in wind energy generation, onshore installed wind power capacity saw a 48% increase from 2012 to 2017 (Schumacher and Yang 2018). Despite having only a voluntary renewable energy target, Oklahoma remains among the four states responsible for more than half of this growth (EIA 2019a). In fact, Oklahoma's wind generation capacity continued to grow by more than doubling between 2014 and 2018 (EIA 2019a; Figure 3).

Figure 3. Oklahoma Annual Wind Power Capacity and Generation 2005 to 2019



Data Sources: windexchange.energy.gov; eia.gov/electricity/data/browser

The rapid expansion of wind energy in Oklahoma, however, has not been free of controversy and push back. While marketed for its economic benefits, opponents to the wind energy proclaim industry incentives have taken advantage of taxpayers and amplified the state's budget crisis (The Windfall Coalition 2016). This is unfortunate because the promise of economic stimulus and resilience was part of the rural benefit sales pitch that the wind industry marketed to rural communities – the very same communities that are all too familiar with boom-bust hardships that go hand-in-hand with oil and gas development (Bagheri et al. 2019). For example, anti-wind power lobbyists, Wind Waste (2020), argue Oklahoma taxpayers paid 80-percent of the $74 million in tax revenue the wind energy industry claims to provide to local communities and education. The claim echoed by other anti-wind energy groups, including The Windfall Coalition and the National Wind Watch, suggest that wind energy's property tax exempt status required the state to reimburse counties, schools, and other entities using the state's General Fund that taxpayers finance. A 2017 article reposted by Wind Watch characterized such tax incentives for wind as "just a vicious, confusing and inefficient distribution of government funds to landowners and rural school districts" (Robson 2017).

Recent years have seen an end to wind energy subsidies and a reversal of state support as opponents cast doubt on the industry's economic merit. In 2017, Frank Keating claimed full responsibility for the "multi-billion-dollar mistake," calling wind energy a "calamity for taxpayers and corporate welfare of the worst kind" (Keating 2017). Although he signed the bill in 2001 to grant wind energy tax breaks, hoping to "jumpstart the industry, help the state, and create jobs," he has now joined a campaign to

end these subsidies (Keating 2017). In a campaign video for the Windfall Coalition, Keating states:

> We are on the hook to write blank checks to mostly out of state and foreign wind investors, all funded by you the taxpayers. It cost us over $120 million dollars last year alone. Money for schools, for teachers, for kids, all gone. As your former governor and a proud citizen of Oklahoma, I ask that all of us work together to end this now. Together we can protect the future of Oklahoma (The Windfall Coalition 2016).

The same year, Governor Mary Fallin signed House Bill 2298 ending the zero-emission tax credit for wind projects operational after July 1, 2017, three years earlier than anticipated (Wertz 2017).

While the contentious political debate continues, little is known about the post-development impacts and perceptions of wind energy as an alternative source of economic opportunity. The political debate in Oklahoma, and subsequent reversal of state support nearly two decades later, raises questions about the relationship between anticipated benefits, advocacy campaigns, changes in perceptions, and implications for the future of wind energy development. Additionally, because the wind industry made economic benefit promises to rural oil and gas communities, research to understand local-level effects is needed.

As such, I examine the impacts of wind energy and post-development changes in perception by analyzing the small, rural host community of Woodward, Oklahoma. Complementing a previous study by Samms (2016), I selected Woodward because of its historic ties to the oil and gas industry and its early support for wind energy following state incentives to recruit the new industry. Woodward County is home to the state's

earliest commercial-scale wind energy developments, and the City of Woodward features wind energy as a paramount part of the community's broader economic and development goals (City of Woodward 2019).

CHAPTER 2: LITERATURE REVIEW

Wind energy has expanded rapidly around the world in recent decades, as global leaders seek a net reduction of global carbon dioxide emissions to mitigate climate change. Development associated with the onshore wind industry, in particular, however, often impacts rural, host communities. Many researchers, both internationally and in the U.S., have explored the pre- and post-development economic, social, and environmental impacts of wind energy projects for areas where they are built. Others have theorized about or estimated the potential positive or adverse impacts from implementing new projects. Given the localized effects, wind energy can also evoke opposition among host community residents. As a result, public perceptions of local wind energy and perceived impacts has become a topic of interest among researchers. This chapter reviews the existing empirical and theoretical research on social, economic, and environmental implications of wind energy projects. The chapter also discusses the ongoing theoretical debate among wind energy perceptions research.

2.1 Economic Impacts

Given the strong financial motivation for wind energy development in rural areas, many researchers around the world have looked at the socioeconomic effects (post-development) and potential (pre-development or simply theoretical) of wind energy projects at various scales (i.e., national, regional, state, or local) using a range of methodology including economic models, case studies, and mixed-method triangulation (i.e., Brown et al. 2012; Landry, Leclerc, and Gagnon 2013; Leistritz and Coon 2009;

Munday, Bristow, and Cowell 2011). Commonly used variables to evaluate the direct, indirect, and induced socioeconomic impacts of wind energy projects include employment, income, local spending, tax revenue, and property values. Direct impacts result from wind industry expenditures such as job creation (e.g., specifically related to construction and maintenance of turbines), lease payments to landowners, and tax revenue to local communities (Lantz 2008). Indirect impacts accrue from a wind project's increased demand for supporting industries such as materials for construction or other goods and services (Lantz 2008; Shoeib 2019). Finally, induced impacts result from the reinvestment of financial gains (from job creation and increased income) back into the community (Lantz 2008; Shoeib 2019). According to Lantz (2008), the combined effect of indirect and induced economic growth can be much greater than direct impacts. These economic variables occur at varying periods of development.

Several studies have employed input-output models like NRELS's Jobs and Economic Development (JEDI) model or a mix of several models to estimate how local wind energy investment affects employment, income, local spending, and tax revenue through direct, indirect, and induced means over various periods of a project's lifecycle. For example, a case study of New Brunswick, Canada employed an input-output economic impact assessment model using publicly available financial data to estimate the potential economic impacts of a local 100-Megawatt wind energy project (Landry, Leclerc, and Gagnon, 2013). Considering the combined effects of employment, income, and local spending growth during construction and operation, the study projected the project could generate 225 jobs per year and approximately $2 million in tax revenue during the construction phase. The operation and maintenance phase could maintain up-to

17 jobs per year and a total annual tax revenue of $935,000 for the province. A similar hypothetical study for the state of Nebraska predicted the economic growth of 20% (7,800 megawatts) wind energy scenario (Lantz 2008). Results indicated that such a scenario would create 20,600 to 36,500 jobs during construction. Additionally, development was expected to pay landowners $27 million to $32 million annually, plus approximately $29 million in property tax each year. Overall, the wind energy scenario was projected to boost Nebraska's economy by $7.8 billion to $14.1 billion over the life of the wind project.

Indeed, these positive economic growth estimates from wind energy investment are common among studies focused on communities in the Great Plains, where towns and residents have "long sought economic development and diversification" (Leistritz and Coon 2009). For instance, a study in North Dakota, which focused on several of the state's northeastern counties, estimated that the construction period of an existing energy center directly contributed $56.4 million in revenue statewide with an additional $169 million created indirectly (Leistritz and Coon 2009). The construction period also created nearly 2,000 direct and secondary jobs statewide. Post-construction estimates included 10 permanent jobs, $1.4 million in local expenditures annually, $413,000 in payments to landowners (for the first year), and annual property tax revenue of $456,000.

Likewise, Slattery, Lantz, and Johnson (2011) analyzed four counties in west Texas and suggested that significant local and statewide economic benefits come from wind energy projects. Short-term estimates at the state level included 4100 full-time jobs (1000 jobs annually) generating $57 million in income and $160 million in economic outputs. This included 225 jobs at the local level generating $9.3 million in income and

$27 million in economic activity. The longer-term operation and maintenance period was estimated to create 350 total permanent jobs and 63 local onsite jobs generating $3.6 million in income. Overall, the two wind farms were estimated to bring more than $1.8 billion in economic activity to the state assuming a 20-year life cycle of the projects. Contrary to Slattery, Lantz, and Johnson (2011) findings, Leistritz and Coon (2009) and Lantz (2008) argued that the economic output estimates are limited by the model parameters and do not provide insight into intangible effects, local economic losses from the displacement of other economic activity, or out-of-state and non-linear expenditures. In fact, Lantz (2008) claimed that often less than 15% of wind project related expenditures remain in the state or county where projects are constructed. Such limitations are inherent of input-output methodology (Lantz 2008).

Hence, other authors have combined economic models, spatial analysis, and/or mixed-method approaches (i.e., multi-economic models with in situ interviews and/or surveys) to investigate further economic-centered variables as well as social impacts of wind farms on nearby communities. For example, Greene and Geisken (2013) used stakeholder interviews, surveys, and economic modeling to illustrate the economic benefits of wind energy in Weatherford, Oklahoma. The study estimated that one local wind energy project created 188 jobs and nearly $400,000 in revenue to landowners. Positive economic benefits were found to continue post-development, though less than during construction, in the form of annual spending, property tax revenue, and lease payments to landowners. Specifically, local property tax revenue was found to supports school districts and other local entities. Business owners interviewed provided monetary examples of the positive economic impact to their respective businesses. For example, a

local construction company "benefited with nearly US$300,000 in revenue from the project including building a 5,000-ft^2 operation facility" (p. 7). Another study by Castleberry and Greene (2017) focused specifically on how wind energy projects benefit local schools. Through a statistical and spatial analysis of 108 Oklahoma school districts over a 19-year period, the study concluded that school districts in western Oklahoma with wind turbines received higher percentages of revenue from local and county sources rather than state funding. The authors suggested increased local and county revenue sources for school districts with wind turbines decreases susceptibility to changes in state funding, while allowing the state greater flexibility to distribute funding to other school districts across the state. Kahn (2013) also found positive economic benefits through increased quality for local schools (i.e., lower student-teacher ratio and higher per pupil expenditures) in west Texas. The study, however, only examined a brief two-year period after the construction of local wind projects. The study by Castleberry and Greene (2017) examined 19-years of data and did not identify statistically significant lower student-teacher ratios or per-student expenditures for counties with wind turbines.

In another Oklahoma centered study, Ferrell and Conaway (2015) further asserted that the wind energy industry provides significant economic benefits to the state of Oklahoma through job creation, increased property tax revenue (through ad valorem taxes) to school districts and local government, lease payments to landowners, and billions of dollars in savings for investor-owned utility customers. The authors further stated that wind energy ad valorem tax revenue benefits school districts in rural host communities, as well as statewide through reduction of state aid and reallocation of state funds for districts without wind farm support. Wind farm projects have primarily been

built in, and thus benefit economically, rural counties experiencing population decline or slow growth in recent decades relative to other counties in the state (Ferrell and Conaway 2015).

Yet, other studies find "wind plants can be built with little economic value for the locality or host community where a project is sited" (Slattery, Lantz, and Johnson 2011, p. 7931). For instance, Munday, Bristow, and Cowell (2011) examined the local economic development opportunity from wind energy development in rural Wales. The study included a multi-method approach triangulating internet data, planning documentation, telephone surveys, semi-structured interviews, and three detailed case studies of specific wind farm projects. Overall, the study found the economic development outcomes from rural wind generation projects in Wales to be "relatively limited" (p. 10). Bristow, Cowell, and Munday (2012) similarly concluded that community benefits from wind energy projects are marginal in Wales. Furthermore, a county-level study in Germany found no economic development effects from installed wind power (May and Nilsen 2015). In comparing the findings to the many American studies finding positive economic outcomes, the authors theorized that these positive economic side-effects are because wind power in the U.S. is typically installed in rural settings, and hence, experience a greater economic shift from investment. In Germany, on the other hand, "such investments do not bring any particularly strong side-effects with them" for the already industrialized counties (May and Nilsen 2015, p. 21). Collins, Hansen, and Hendryx (2012) suggested minimal positive social and economic findings from wind energy result because the full socioeconomic benefits of projected and existing

wind energy development may not be fully realized for nearly a century, particularly when compared to conventional energy sources.

Notwithstanding these debates in the literature about socioeconomic benefits, community members living near wind projects are generally supportive of development (Hoen et al. 2019). In fact, during a four-year national survey of 1,674 residents living near turbines in the U.S., a project by the Lawrence Berkeley National Laboratory found that only 8% of respondents responded with very negative or negative attitudes towards nearby existing wind projects (Hoen et al. 2019). Among the respondents with negative attitudes, perceived impacts of turbines on property values were a primary reason for resistance (Hoen et al. 2019). In addition to the employment, income, local spending, and tax revenue, wind development's potential impact on nearby property values is another economic focused topic in wind energy literature.

2.1.1 Property Value

Given the potential negative impacts of wind energy where projects are built (discussed in Section 2.2.2), there has been growing public concern that wind turbines may devalue nearby residential property values. A number of studies have explored the relationship between home values and juxtaposed wind turbines.

In a case study of several northern New York counties, Heintzelman and Tuttle (2012) found mixed results regarding the impact of wind turbines on nearby property values. The study found that the presence of wind turbines was associated with reducing nearby property values in two out of the three counties included in the study. The authors suggested the differences may have to do with design and placement of the various facilities. Heintzelman and Tuttle (2012) further indicated that compensation to

landowners from wind farm developers may not be fully compensating them for the lost property value, and homeowners not receiving compensation are being harmed economically by wind farm externalities. A European study by Gibbons (2015) also studied the local benefits and costs of wind farm development in England and Wales by considering how wind turbine in the landscape effect nearby housing sale prices. The author assumed changes in housing sale prices and visibility of wind turbines offer evidence of local public "preference for landscape views" (p. 178). Using a difference-in-difference statistical approach to control for pre-existing differences, Gibbons (2015) found turbine visibility in the landscape to reduce home prices by 5-6% for homes within 2 km and around 6.5% for homes within 1 km of turbines. The price reduction effect was found to fall as distance from wind farms increased, decreasing to zero between 8 and 14 km. The study also found home values where wind turbines are not visible increased, suggesting homeowners are willing to pay more to avoid wind turbine visibility.

Diversely, other studies have found that homes near wind turbines have not experienced statistically significant decreases in value. Hoen et al. (2011) investigated the impact of wind energy development on nearby home prices by considering frequently cited negative perceptions, including scenic vista, area, and nuisance stigmas. Using residential real estate transaction data for homes near wind turbines across the U.S., the research found no statistically significant evidence that such stigmas negatively impact home prices. The authors suggested that the results are consistent with other studies that found negative attitudes toward wind energy facilities fade with time.

Expanding on previous studies, Hoen et al. (2015) included distance and development period (i.e., prior to announcement, after announcement but prior to

construction, and post construction) to study home-value impacts for over 50,000 homes in 27 counties and nine states (including Oklahoma). Results showed no statistical evidence of wind turbines negatively affecting homes prices during any stage of development. It is suggested that if home-value impacts do exist then they are either extremely small or only present in a small area (Hoen et al. 2015). In a similar Oklahoma study, Castleberry and Greene (2018) looked at the impact of wind turbines on real estate prices in Custer, Harper, Roger Mills, Washita, and Woodward Counties. Like Hoen et al. (2011) and Hoen et al. (2015) Castleberry and Greene did not find nearby wind turbine projects to statistically decrease property values. In fact, results showed that real estate prices surprisingly increased closer to wind turbine facilities and proposed construction sites. As such, turbines may not have a negative impact on home and property values. Instead, land and homeowners recognize wind energy infrastructure as a potential source of investment and a valuable property asset (Castleberry and Greene 2018).

Overall, the published research about wind energy and the economic impacts indicates substantial positive benefits for states, counties, and communities in the United States where wind farms are largely constructed in rural, economically challenged areas. Economic benefits are typically measured using standard variables such as employment, income, net gains, and tax revenue and can vary considerably depending on the location, project scale, and development phase. Specifically, wind energy development yields much greater economic benefits during the early construction, with operation and maintenance resulting in less, yet more long-term, gains. Further, few studies used a

mixed-method, case study approach to gather a more holistic view of local economic impacts from nearby wind energy development.

2.2 Environmental Impacts

2.2.1 Environmental Benefits

In addition to economic factors, wind power development has been primarily driven by concerns about the negative environmental effects of fossil-fuel combustion (Chandy 2020; Dorrell and Lee 2020). Indeed, modern wind energy is considered a low-carbon, clean, renewable energy source that reduces the need for fossil-fuel burning for electricity generation, thus reducing the negative consequences of conventional sources. The most generally recognized environmental benefits of wind-powered electricity generation include the abatement of landscape degradation, the reduction of atmospheric pollution, as well as decreased water consumption (Jaber 2013).

Emission Savings

The most widely discussed benefit of wind energy is that it does not produce air pollution directly while producing electricity. While parts manufacturing, construction, and maintenance generates minor emissions, wind energy creates considerably less air pollution than conventional energy sources (Saider et al. 2011). According to the American Wind Energy Association (AWEA), wind-power generated electricity in the United States avoided 201 million metric tons of carbon dioxide emissions in 2018 alone (AWEA 2020). In fact, the EPA estimated that every wind turbine installed avoids 4,632 metric tons of carbon dioxide emissions per year (EPA 2019). These carbon dioxide savings from wind energy development both directly and indirectly play a major role in

mitigating global climate change by slowing the growth of atmospheric concentrations (Keith et al. 2004).

Wind energy generation also significantly diminished other air pollutants associated with fossil-fuel sources, such as coal and natural gas, which emit pollutants like sulfur dioxide and nitrogen oxides (AWEA 2020). The U.S. Department of Energy (2015) reported wind generation in 2013 avoided approximately 157,000 metric tons of sulfur dioxide and 97,000 metric tons of nitrogen dioxide emissions. These emission reductions, in turn, have human health and indirect economic benefits. For example, the AWEA estimated that these "reduction in air pollution created $9.4 billion in public health savings in 2018 alone" (AWEA 2020). Greene and Morrisey (2013) calculated electricity generation from wind power in Oklahoma to prevent 26 million tons of pollution from SO_2 (sulfur dioxide), NO_x (nitrogen oxide), and CO2 (carbon dioxide) in the previous decade. The authors projected that reduction of atmospheric pollutants saved over a thousand lives and tens of millions of dollars each year. Greene and Morrisey (2013) also approximated that wind power has the potential to provide $76 million to the state through emission-trading credits. Kahn (2013) further showed that decreased emissions from wind farm development in west Texas has contributed to improved air quality levels, and thus, improved quality of life for counties where wind farms have replaced fossil-fuel power plants.

Water Conservation

In addition to emissions savings, wind energy requires little to no water during operation to produce electricity. While conventional power plants require millions of liters of water per day for cooling, cleaning, and processing, wind energy consumes less

than 0.005 liters of water per kWh (Saidur et al. 2011). In 2013, the U.S. Department of Energy (2015) estimated wind generation in the U.S. saved 36.5 billion gallons of water, or 116 gallons per person. Additionally, the AWEA (2020) found water savings from wind energy generation increased to 95 billion gallons of water in 2017 – equivalent to 723 billion bottles of water. As a result, wind energy provides drought-prone regions in rural America and other parts of the world an alternative electricity options—all the while conserving water needed for domestic use, irrigation, agriculture, and recreation.

Landscape Use and Degradation

Wind energy exploration and project construction is less damaging to the natural landscape than some conventional energy sources such as coal. Wind farms have a small footprint, leaving approximately 98 percent of the land they are built on undisturbed (Denholm et al. 2009). The U.S. Department of Energy (2015) predicted wind energy infrastructure to only require 0.04 % of contiguous U.S. land area by 2050. As a result, wind turbines can coexist among "natural habitats and human economic activities," such as agriculture (AWEA 2020). According to Ferrell and Conaway (2015), wind project infrastructure also coexists with minimal interference to oil and gas activities and other land use in the same proximity. Furthermore, unlike other damaging resource extraction such as mountaintop removal mining for coal, land used for wind turbine construction can be more easily rehabilitated to its original condition after decommissioning (Jaber 2013).

2.2.2 Negative Environmental Impacts

While wind energy is widely considered a healthier and more environmentally friendly source of energy (Saidur et al. 2011), it is not without controversy. Michaels et

al. (2017), for instance, question the amount of emission savings from renewables when compared to fossil-fuel sources because of their lower capacity. The authors suggest that while the main advantage of wind power is to reduce carbon emissions, avoided emissions depend on the source being replaces. The relationship is not one-to-one from fossil-fuels to renewables for electricity generation capacity. In fact, wind power has an average full-year capacity of 25.5 %, because of its intermittent nature (Michaels et al. 2017). This indicated wind power requires four times the installed capacity of coal to produce the same amount of electricity and avoid its associated emissions. In turn, valid economic analysis of wind power "must adjust the avoided capacity costs of a new 1-megawatt generator to make it equivalent to the capacity factor of an eliminated plant" (Michaels et al. 2017, p. 23).

Furthermore, the size and scale of infrastructure required to harness power from the wind brings its own environmental consequences. While commercial-scale wind energy produces fewer negative effects on the environment than conventional sources, it does bring about several environmental disadvantages (actual and perceived) where projects are built. The primarily discussed negative environmental issues related to wind energy projects include ecological, human, and climate-related impacts (Dai et al. 2015). Some key topics raised in the literature related to adverse environmental impacts for communities and wildlife, include bird and bat mortality from wind power infrastructure, noise induced by turbine blade rotation, and visual impacts on the landscape (Dai et al. 2015; Jaber 2013; Leung and Yang 2012; Saidur et al. 2011).

Wildlife Impacts: Birds and Bats

The size and scale of modern commercial wind energy facilities have continued to increase over the years, with newer average 2.55 megawatt capacity turbine reaching 90 meters in hub height and 121 meters in blade diameter (Wiser et al. 2020, p. 36). In total, a modern turbine can be as tall as a 40-story building (Kunz et al. 2007). Further, according to the Global Wind Energy Council (GWEC), over 560,000 wind turbines (60.3 gigawatts) were installed around the world by the end of 2018 (GWEC 2019). As turbines reach new heights and wind farms grow in scale, the primary concerns regarding how these facilities impact wildlife focuses on avian species, specifically birds and bats.

Wind energy development can result in direct mortality or injury to bird and bat species from collision with turbine blades and towers (Drewitt and Langston 2006; Kunz et al. 2007; Saidur et al. 2011). While more dangerous lattice style turbines have been largely replaced with monopole designs (Saidur et al. 2011), modern monopole turbines still pose a risk to avian species. Research findings on the exact cause and precise mortality rate of birds and bats from wind turbine collisions vary substantially. An early study by Erickson, Johnson, and Young (2005) found wind turbines in the United States to kill an average of 28,500 birds in 2003. Comparing bird mortality rates from wind, nuclear, and fossil-fuels, Sovacool (2009) showed the mortality rate is much less. The study estimated wind turbines in the United States killed around 7,000 birds in 2006 (Sovacool 2009). Some more recent studies by Loss, Will, and Marra (2013) and Smallwood (2013) suggested early research on bird mortality underestimate rates due to differences in sampling protocol, analytical methods, and degree of uncertainty. These authors have attempted to improve comparability among previous case studies and apply

common adjustments to improve rate accuracy. As a result, fatality rate estimates increased drastically compared to earlier reports. Loss, Will and Marra (2013), for example, extracted and adjusted estimates from previous studies and industry reports to estimate that an average of 234,000 birds die from collisions with monopole turbines annually in the United States. The authors found these mortality rates to vary by region and increase with increasing turbine height. Similarly, Smallwood (2013) estimated annual bird fatalities from wind-energy in the Unites States at 573,000, 20-times greater than earlier estimates, despite an only 8-fold increase in installed wind energy from 2003 to 2012.

While wind turbines may pose a risk to birds, others state the impact is negligible when compared to other anthropogenic factors such as vehicles, buildings and windows, pesticides, hunting, communication towers, and cat predation (Drewitt and Langston 2006; Erickson, Johnson, and Young 2005; Saidur et al. 2011; Sovacool 2009). In fact, cats are estimated to kill nearly 100 million birds annually (Erickson, Johnson, and Young 2005). Sovacool (2009) further highlighted the shortcomings of bird fatality estimates by clarifying that conventional "fossil-fueled facilities are about 17 times more dangerous to birds on a per GWh basis" (p. 2246). The author estimated that fossil-fuels were responsible for 14.5 million avian deaths in 2006, compared to 7193 deaths related to wind energy (Sovacool 2009).

While most early studies of how wind turbines impact avian species specifically focus on bird fatalities, a growing number of studies have reported large numbers of bat fatalities from turbines (Kunz et al. 2007). Smallwood (2013) estimated 888,000 bat fatalities per the 51,630 megawatts (or 17.2 deaths/MW) of installed wind power in the

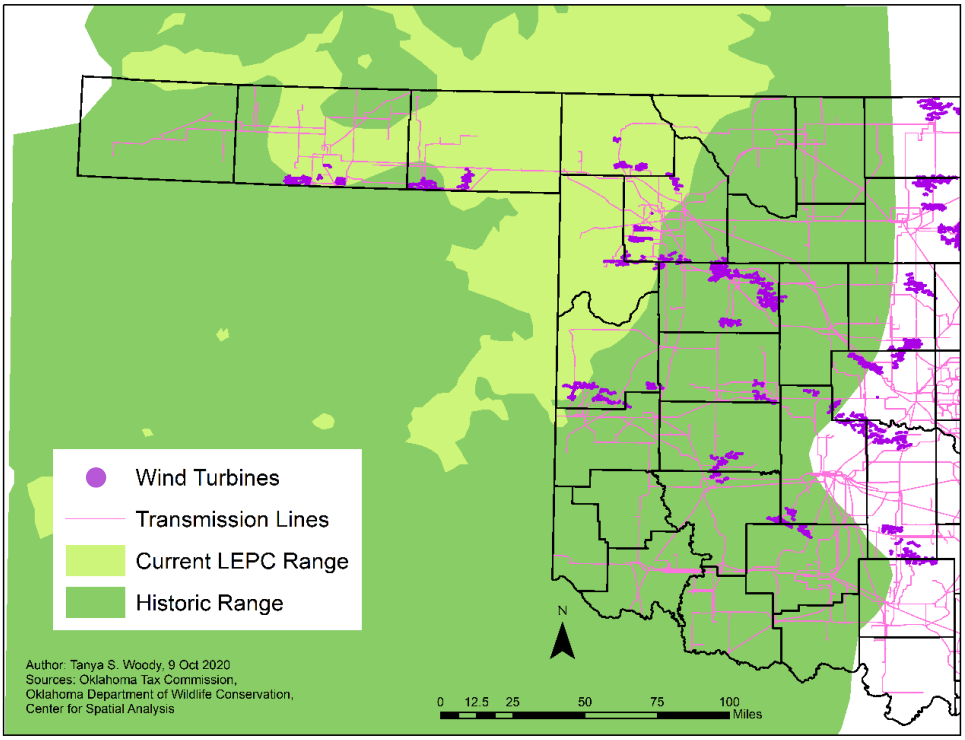
United States per year. Hayes (2013) estimated U.S. bat fatalities from interactions with turbines at over 600,000 in 2012. Another review of bat fatality rates from turbines in the United States estimated a mortality rate between 1.2 (in the Northwest and Rocky Mountain regions) and 46.3 (in the Eastern region) deaths per turbine annually (Saidur et al. 2011). A study by Piorkowski and O'Connell (2010) in Harper and Woodward counties, Oklahoma calculated bat fatalities near a 102-megawatt wind farm to range from 1.19-1.71 deaths per turbine or 1.03-1.37 deaths per megawatt from 2004 to 2005. In fact, the researchers attributed 111 deaths from seven species of bats to a nearby 68-turbine wind farm. The authors only found eleven turbine-killed birds within their study area. Several other studies have agreed on relatively low rates of bird fatalities from direct interaction with turbines in the Great Plains region (Loss, Will, and Marra 2013; Piorkowski 2006).

Instead, indirect effects of wind energy development pose a much greater threat to bird species in in the Great Plains, specifically prairie grouse. The Lesser and Greater Prairie-Chicken are medium to large, nonmigratory birds of the grouse family found in the grasslands of the southern Great Plains. Considered umbrella species[2], both are of conservation concerns due to population decline from habitat loss and fragmentation over the past century (Pruett, Pattern, and Wolfe 2009b). Together, these game birds are often deemed "indicators of ecosystem health for the suite of other avian and mammalian

[2] Mussmann et al. (2017) define an umbrella species as "one whose extensive habitat requirements encompass many other biodiversity components, and whose protection would yield a generalized effect" (p. 11). As "umbrella" species, the Lesser and Greater Prairie-Chicken represent conservation efforts of not only prairie grouse but of numerous nontargeted species in the North American prairie As such, the health of the species and its habitat are used as indicators of how anthropogenic features negatively impact the prairie as a whole.

species that occupy [the vast North American prairie]" (Hagen 2010). Wind energy development in the Great Plains largely overlaps the prairie chicken habitat, raising further concerns about its impacts on the already threatened species (i.e., see Figure 4). Prairie-chicken rarely fly higher than six meters, and therefore, are not at risk of collision with turbine blades (Pruett, Patten, and Wolfe 2009a). Research has suggested the tall structures of wind energy facilities (turbines and transmission lines), however, disrupt the mating, nesting, and grazing behavior of both Greater and Lesser Prairie-Chicken by indirectly reducing and fragmenting the species' already limited habitat (Hagen 2010; McNew et al. 2014; Pruett, Patten, and Wolfe 2009a; Pruett, Patten, and Wolfe 2009b).

Figure 4. Lesser-Prairie Chicken Habitat and Wind Energy Development in Western Oklahoma



For instance, in a spatial-temporal study of prairie-chicken behavior in northwest Oklahoma, Pruett, Patten, and Wolfe (2009b) found that both species avoided wind-energy structures by hundreds of meters, limiting movement of the species for grazing and mating purposes. Similarly, Robel (2002) estimated that this avoidance behavior of a wind-energy infrastructure by Greater Prairie-Chicken in the tallgrass prairie of Kansas reduced their habitat by 800 hectares (or nearly 2,000 acres) per turbine, totaling approximately 19,000 acres of unusable habitat. It is hypothesized that prairie-chickens avoid tall structures of wind facilities out of natural survival instinct because turbines and transmission lines provide perch locations for predatory species, such as raptors (Pruett, Patten, and Wolfe 2009b). Pruett, Patten, and Wolfe (2009b) clarified that although prairie-chickens avoided wind energy structures, they were less likely to avoid nearby roads. This finding provided further evidence that prairie-chicken perceive tall structures as a barrier to species-typical behavior because of height rather than sound disturbance.

However, other researchers have reported no spatial displacement of prairie-chickens near wind energy facilities. A more recent study conducted in the Nebraska Sandhills found little evidence that pre-existing wind turbines negatively affected prairie chicken nest site selections and nest survival (Harrison et al. 2017). Additionally, a five-year study in Kansas by McNew et al. (2014) found that "proximity to turbines did not negatively affect reproductive ecology of prairie chickens" (p. 1089). Regardless of mixed findings, ecological impacts of wind energy projects can have social implications, causing opposition from local preservationists seeking to protect specific habitats. The contradiction between wind energy developers and wildlife conservation goals has been

characterized as a ‘green-on-green’ conflict, where environmentalists are set against each other (Warren et al. 2005. p. 854).

Human Impacts: Noise, Flicker Effect, Human Health, Aesthetics

In addition to wildlife impacts, wind energy impacts people living nearby projects. Commonly cited negative environmental consequences on people are noise and flicker effect disturbances, related human health problems, aesthetics, and threats to rural, natural landscape (Jaber 2013; Saidur et al. 2011). Research shows noise and flicker effect issues produced by wind turbines can range from mere annoyances to more serious health concerns for people living near wind farms (Bakker et al. 2012; Harding, Harding, and Wilkins 2008; Knopper and Ollson 2011; Pedersen and Waye 2004). However, like visual impacts, reported noise complaints are found to be subjective and not solely dependent on noise itself (Knopper and Ollson 2011). Visual impacts of wind farms are likely the most subjective and complex issues, with aesthetic scrutiny varying by perceived landscape value (Leung and Yang 2012; Molnarova et al. 2012).

Noise and Flicker Effect Impacts

Wind turbines produce mechanical and aerodynamic noise during operation (Saidur et al. 2011). Mechanical noise occurs from a turbine’s machinery, such as the gearbox and generator, while aerodynamic noise is caused by the blades rotating through the air (Jaber 2013). While noise from turbines has decreased with technological advancements, often no louder than a kitchen refrigerator from 350 meters away (Saidur et al. 2011), the issue remains both a public concern and commonly studied environmental impact (Rogers and Manwell 2004). In southern Sweden, Pedersen and Waye (2004) evaluated the statistical relationship between public annoyance from wind

turbines noise and the relationship to sound level and characteristics. Pedersen and Waye (2004) used a household questionnaire asking people living near a wind farm about their experiences with environmental noise. Questionnaire results compared with measurements of relative sound loudness revealed exposure to turbine sounds above 32.5 dBA (equivalent to a sound between a whisper and a suburban area at night[3]) were perceived as an annoyance by a number of nearby residents. The study showed levels of annoyance increased linearly with sounds above 32.5 dBA and sounds above 40 dBA (suburban night noise) were viewed as very annoying. Respondents annoyed by turbine noise described the sounds characteristics as swishing, whistling, and pulsing or throbbing. Turbine noise above 35 dBA was also reported to be a source of sleep disturbance by 23% of the respondents. In a similar study using self-reported questionnaire data of residents living near wind turbines in the Netherlands, respondents reported that long-term exposure to turbine noise caused negative effects beyond mere annoyance, such as sleep disturbance and psychological distress (Bakker et al. 2012).

Other researchers, on the other hand, such as Bakker et al. (2012), highlighted the subjective nature of self-reported annoyance from turbine noise. Bakker et al. found that homeowners nearest to turbines, and thus more likely exposed to higher noise levels, were most likely receiving monetary benefits and were, in fact, less likely to be annoyed by noise. Similarly, Pedersen and Waye (2004) concluded that negative attitudes toward

[3] Researchers measure wind turbine noise using dBA, A-weighted decibels. A-weighted decibels express the "relative loudness of sounds in air as perceived by the human ear" (https://whatis.techtarget.com/definition/A-weighted-decibels-dBA-or-dBa-or-dBa). A decibel level comparison chart compiled by Yale is available at https://ehs.yale.edu/sites/default/files/files/decibel-level-chart.pdf.

visual impacts of turbines enhanced associations of noise being perceived by residence as an annoyance. In their extensive review on the relationship between wind turbines and health effects, Knopper and Ollson (2011) similarly found turbine noise complaints to often be associated with attitudes about the visual impacts of nearby turbines and not only the noise alone. While these and other studies have included self-reported health impacts following exposure to turbine noise, Knopper and Ollson (2011) explained researchers have not found a causal or statistical link between exposure to wind turbine noise and actual physiological health effects.

Turbines can also create a shadow flicker effect on a landscape when the sun shines through rotating turbine blades. Turbine blades can cast these shadows on homes and through the windows of residents living near wind farms, "affecting the internal illumination giving rise to flicker that cannot be avoided by occupants" (Harding, Harding, and Wilkins 2008, p. 1096). The main concern associated with shadow flicker effect is its potential risk to people susceptible to seizures. Researchers such as Smedley, Webb, and Wilkins (2010) and Harding, Harding, and Wilkins (2008) have investigated the potential relationship between turbine blade flicker effect and the risk of seizures for people with photosensitive epilepsy. According to both studies, the event is rare, only posing a risk for 1.7 people per 100,000 of those with photosensitivity. The authors also suggested that that seizure-provoking effects of flicker depend on very specific factors such as blade rotation speed, solar elevation angle, and position of the observer. As Knopper et al. (2014) explained, "modern turbines commonly spin at rated well below [the threshold needed to induce photosensitive seizures]" (p. 14). Still today, little research has been conducted on flicker effect as an annoyance (Knopper et al. 2014).

Visual Impacts

The assessment of wind energy visual impacts remains a complex and subjective issue (Leung and Yang 2012). Although visual impacts are subjective in nature, wind energy development results in a very real, unavoidable, and long-term change to the often-rural landscape where infrastructure is constructed. As explained by Sullivan et al. (2012), the "enormous height of the wind turbines and the size of large arrays can make them visible for very long distances" (p. 7). In fact, a visual impact assessment (Sullivan et al. 2012) found that typical modern wind turbines can be seen up to 58 km (36 mi) away, remaining a visually dominant focus of the landscape for up to 19 km (12 mi). The size and color of turbines along with scale, layout, and specific location characteristics for a project all affect the visibility of a wind farm in the landscape (Sullivan et al. 2012). These objective factors, however, only provide part of the overall picture about the visual impacts of wind farms.

As expressed by Warren et al. (2005), "the landscape impacts of windfarms are exacerbated by the fact that the locations with the highest wind resource are often precisely those exposed upland areas which are valued for their scenic qualities and which are often ecologically sensitive" (p. 857). Because of their stark and vast contrast against the natural landscape, the way wind farms are viewed and judged by observers can vary widely from site to site and within the same community. For some people, wind turbines are considered beautiful and representative of a better, more sustainable future. For others, they serve as an unpleasant visual intrusion in the natural landscape. Landscape value and perceived quality can be a strong factor in negative public response to the placement of wind turbines (Molnarova et al. 2012). A survey by Molnarova et al.

(2012) found that respondents overall viewed wind turbines as a deterioration of the landscape. Wind turbines placed in highly attractive, natural landscapes were found to invoke the strongest negative response. In a similar study by Lothian (2008) in Southern Australia, surveyed respondents generally perceived wind turbines as a negative effect on landscapes with high scenic value. However, turbines were found to have a positive effect on landscapes with lower scenic value. Both of these studies suggest wind turbines are more tolerated in landscapes with pre-existing man-made structures. Several other studies have corroborated the importance of landscape aesthetics value and wind farm perceptions (e.g., Betakova, Vojar, and Sklenicka 2015; Johansson and Laike 2007). As a result, negative reaction toward turbines have less to do with the turbines characteristics (i.e., size, color, scale) and much more to do with technological elements being perceived as out-of-place in the natural or cultural environment. However, concerns for and perceptions of local wind farms can extend beyond pure aesthetic issues. The complex issues and commonly held theories in the emerging literature regarding public perceptions of wind energy are explored in the following section.

2.3 Public Perception

While the public in the United States and across the globe are generally supportive of wind energy (Mulvaney, Woodson, and Prokopy 2013), localized impacts can be a primary source of opposition for specific wind farm projects. Public opposition to projects can delay or even prevent wind energy development and thus is considered a major barrier to renewable energy integration (Batel, Devine-Wright, and Tangeland 2013; Devine-Wright 2005; Pidala 2017). Umit and Schaffer (2020) elaborated on this

issue, explaining “successful deployment of wind energy depends on public attitudes which have long puzzled social scientists” (p. 2). Thus, because wind energy is viewed as a valuable energy source for meeting emission reduction goals and mitigating climate change, understanding opposition to development has been a key goal among wind energy research. As a result, public perception of and attitudes towards wind energy has become an extensive area of academic inquiry. This subsection discusses some of the common theoretical concepts, debates, and findings from specific case studies among perception literature.

2.3.1 NIMBYism

The study of social perceptions toward wind energy development has evolved from a simple for-or-against concept to a more complex discourse seeking to explain the multidimensional factors driving support or opposition. Early scholars frequently used the NIMBY, or “not-in-my-backyard,” theory to characterize local-scale opposition to wind power (Rand and Hoen 2017). The theory has widely been used by authors to explain how the public is relatively supportive of wind power on an abstract level, though frequently object to construction of wind farms within their community (Devine-Wright 2005; Krohn and Damborg 1999; Petrova 2016). From this perspective, wind energy technology itself is not controversial, but siting is problematic, resulting in conflict and inciting hostile reactions from some people near development. Local externalities related to wind farm siting, such as visual impacts and noise, are frequently noted as a common source of opposition (Devine-Wright 2005; Krohn and Damborg 1999; Rand and Hoen

2017). Several studies have explored proximity to development as an explanation for negative local attitudes and the time component of NIMBY protests.

Physical Proximity

The physical proximity hypothesis theorizes that those living closer to wind farms will be more opposed to development than those living farther away (Devine-Wright 2005). Supporting this theory, Swofford and Slattery (2010) found that Texans living closest to wind farms, and within sight of turbines, expressed the most negative attitudes toward development. Van der Horst (2007) similarly concluded that "on aggregate, proximity does have strong influence on public attitudes to proposed projects" but explained that "the nature, strength and spatial scale of this effect may vary according to local context and value of the land (p. 2706). However, there are exceptions to the rule, and thus findings of reversed NIMBYism. For instance, an opinion poll conducted in Sydthy, Denmark, an area with one the highest concentrations of wind turbines in the world, contradicted distance as an explanation for opposition (Krohn and Damborg 1999). In fact, the study found that people living nearest to wind turbines (closer than 500 meters) held the most positive and supportive views of local wind energy, while people living farther away in the city expressed more negative perceptions of wind energy in the countryside. Also challenging the proximity hypothesis, Johansson and Laike (2007) found no difference in attitudes towards turbines between three groups living at various distances from existing turbines in an agricultural area of southern Sweden. Instead, how groups of turbines were perceived to 'fit in the landscape' was found to be more important to residents than the characteristics of turbines (i.e., distance, height, color, etc.). According to Devine-Wright (2005), such a lack of empirical consensus to support

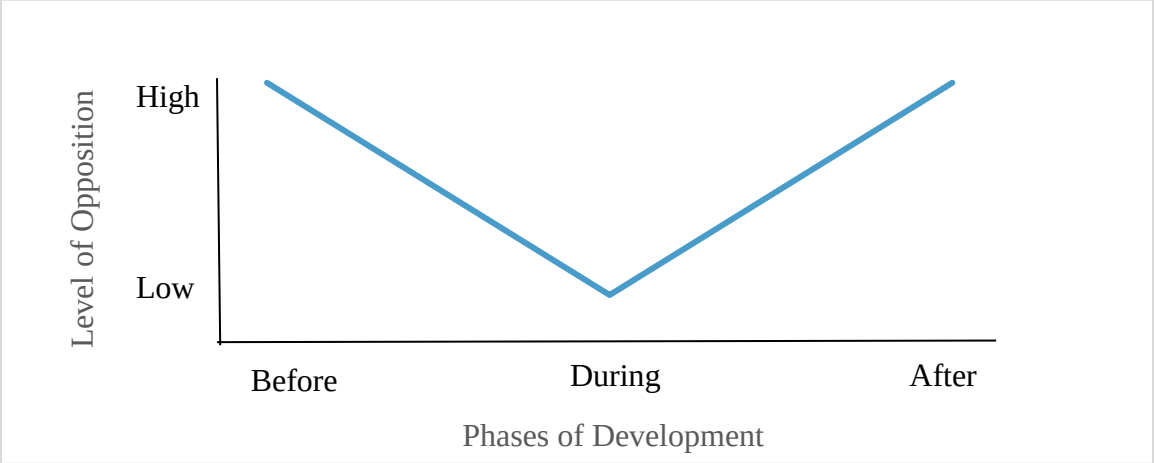
the physical proximity hypothesis suggests that public perception research should "go beyond purely physical parameters, such as proximate distance, turbine size and colour" to explain negative perceptions of wind farms. Instead, Devine-Wright (2005) claimed that perception studies should consider 'social' distance (i.e., the opinions of friends and family living in the community) and local context as more important factors.

Stages of Acceptance

In addition to proximity, researchers have framed NIMBYism in terms of longitudinal characteristics, or the dynamic nature of perceptions over the various stages of wind farm development (i.e., before, during, and after planning and installation). Several studies have suggested that the level of public acceptance follows a U-shaped curve over the development phases of wind energy projects (Devine-Wright 2005, p. 180; Krohn and Damborg 1999, p. 958; Petrova 2013). This support curve illustrates how opposition to wind farm development is low before construction, highest during siting and construction, and dispels over time as the public grows more favorable to the local change (Figure 5). While public support for wind energy is generally high, Krohn and Damborg (1999) suggested that lack of understanding and experience with wind energy or outdated preconceptions may lead to fear during siting and construction phases of development leading to lower acceptance rates. Yet, as Wilson and Dyke (2016) illustrated, acceptance rates tend to increase after construction. Wilson and Dyke (2016) investigated public attitudes towards the social, economic, and environmental impacts of wind energy in Western Cornwall pre and post installation. They found that five years after installation public perceptions grew more positive towards local turbines as many residents had become 'accustomed' to seeing them and visual effects had grown

insignificant. Additionally, public attitudes improved post-development regardless of 99-percent of interviewees claiming that the wind farms offered little to no benefits to the local community. This dynamic progress of public response from positive to critical to more positive indicates that NIMBYism can dissipate with personal experience and knowledge of wind energy (Eltham et al. 2008; Krohn and Damborg 1999). The U-support curve, however, does not apply to every wind project situation, and negative perceptions of development can actually increase with increased exposure (Devine-Wright 2005; Petrova 2013; Swofford and Slattery 2010).

Figure 5. U-support curve of local wind energy acceptance



Source: Adopted from Devine-Wright 2005, p. 130

Theoretical Debate

Critics have argued that the simple NIMBY theory and related hypotheses (i.e., proximity and longitudinal studies) lack empirical evidence and explanatory power because it oversimplifies "the complex, multidimensional nature of public perceptions of wind farms" by only describing the existence of local opposition and failing to investigate the various factors influencing public attitudes towards wind energy (Aitken 2010; Devine-Wright 2005, p. 129; Slattery et al. 2012). Another key argument is that NIMBY literature makes broad assumptions about the general public's knowledge, morals, and values (Rand and Hoen 2017). For example, early studies using the NIMBY concept often made key assumptions about the moral values of objectors; thus, branding those opposed to wind power development as "wrong" and thus against what is "for the greater good" and "altruistic" (Aitken 2010). In a review of early NIMBY literature, Freudenberg and Pastor (1992) outlined three perspectives of public opposition to new technologies "[reflecting] the authors' interests as well as assumptions" (p. 41). The three perspectives included "(a) the public as ignorant and/or irrational, (b) the public as selfish, and (c) the public as prudent" (p. 41). Burningham, Barnett, and Thrush (2006), also described the popular usage as portraying NIMBYs "as usually selfish and parochial individuals who place the protection of their individual interests above the common good" (p. 4). From this pejorative perspective, the NIMBY explanations for opposition to local development neglected the place-specific, socially constructed factors contributing to public attitudes toward wind farms (Devine-Wright 2005; Devine-Wright and Howes 2010; Petrova 2013).

Building on these and other critiques, many authors have rejected NIMBY theory and sought to build a more robust theoretical framework for analyzing public perception of wind energy development by dismissing early assumptions and redirecting focus to understanding the depth of factors influencing public reactions. Devine-Wright (2005) provided an extensive review of literature on NIMBY public perceptions of wind energy development. Through a critical assessment of existing research, he classified the multidimensional nature of public behavior toward wind energy by identifying six distinct categories: physical and contextual attributes, political and institutional, socio-economic, social and communicative, local ideology and personal experience (p. 134-135; see summary of categories and aspects on p. 135). The review argued that existing research merely discussed 'what' people objected to in the perceptual process but neglected to adequately explain 'why' specific perceptions developed. Devine-Wright suggested this gap results from limited perception methodology, recommending that future perception research be grounded in social theory, specifically place-based theory (p. 136). Other critics agree that 'NIMBYism' tends to oversimplify the complex issue of local opposition and therefore does not fully explain the breadth of possible factors shaping public perceptions and response to large-scale wind developments (e.g. Burningham et al, 2015; Kempton et al. 2005; Wolsink 2006). As a consequence, early NIMBY research and its criticisms prompted more in-depth, sophisticated public response studies. In effort to fill this gap, later perception studies have investigated various theoretical frameworks trying to contextualize support and opposition. Existing research explores a range of factors influencing public attitudes and response such as

landscape and socioeconomic impacts, inclusiveness and equality, place-based influences, and institutional factors.

2.3.2 Place-Attachment

For instance, place-attachment and trust-based research aims to deepen understanding of opposition by drawing on the social psychology of the complex emotional bond between people and the places they inhabit (Altman and Low 1992). Studies adopting place-attachment theory conclude that opposition to wind power ensues when people feel that turbine siting directly threatens the local landscape that they value (e.g., Devine-Wright 2009; Devine-Wright 2014; Devine-Wright and Howe 2010; Fast and Mabee 2015). Landscape-based opposition is more complex than a mere visual-aesthetic response (Devine-Wright 2005; Jessup 2010) or a simple concern for turbines "spoiling a nice view" (Bidwell 2013). Instead, place attachment theory suggests that local landscapes 'threatened' by wind development have symbolic value (Kempton et al., 2005) and cultural meaning (Bridge et al. 2013) for local residents, thus fueling opposition to large-scale change. Further, resistance and protective behavior of place can occur when landscape change proposed by 'outsiders' are viewed as insensitive to local values or a 'disruption' to place attachment or a threat to one's very identity tied to the landscape (Devine-Wright 2009; Devine-Wright and Howes 2010). According to Devine-Wright and Howes (2010), place attachment explains negative response to wind farms and protective behavior response particularly in areas where the industrial nature of wind energy threaten places perceived as natural, wild, or places valued for their restorative qualities (i.e., places that allow us to escape from cities and industrialized areas). However, the value and meaning attributed landscape varies widely from place to place

and from person to person, depending on local environmental, social, and economic experience and histories (Van der Horst 2007). As such, place attachment and judgement of change is highly subjective (Eltham et al. 2008).

Investigating the concept of place attachment as an alternative approach to NIMBY theory, Devine-Wright and Howes (2010) conducted an empirical study of public response to offshore wind energy in two coastal towns near a single proposed offshore project in North Wales. The multi-phase study used in-depth interviews, focus groups, and questionnaires to explore the relationships between sense of place, symbolic meaning, trust, emotional response, and intended behavioral response. Results uncovered divergent interpretations of place, and thus perceptions of wind energy development, between the two towns. Participants in the town of Llandundo depicted the town as a 'picturesque' 'holiday resort' luring tourists with its 'scenic beauty' and 'beautiful, open, natural seascape' (Devine-Wright and Howes 2010, p. 275-276). As a result, residents strongly opposed the wind energy project because of the concern that it posed a threat not only to the beautiful, natural seascape but also to the lucrative local tourism. Even though it is also a coastal community, only 10 km from Llandundo, participants in the other study location of Colwyn Bay depicted their town as an 'undesirable', 'forgotten', 'run down', and a 'dying' city (Devine-Wright and Howes 2010, p. 275). Respondents in Colwyn viewed the wind energy project more positively and as an 'enhancement' to place with the potential to boost the local economy and provide employment opportunity (Devine-Wright and Howes 2010, p. 278). The results suggest that relationship between sense of place and response to development projects may hinge upon restorative

characteristics of place as well as the related local economic situation and perceived benefits.

2.3.3 Trust

The place-attachment framework alone does not posit that strong place attachment will inevitably result in a negative response to landscape change, “but depends upon how individuals interpret change, with such interpretations shaped by social context, moderated by trust in key organizations" (Devine-Wright, 2009; Devine-Wright and Howes, 2010, p. 278). Devine-Wright and Howes (2010) concluded that levels of trust or lack of trust in wind developers or local opposition groups in host communities can either strengthen or dissolve the relationship between place attachment and opposition to nearby wind development projects. Fast and Mabee (2015) similarly situated trust-building as a natural corollary to place-attachment and local wind power opposition. Fast and Mabee (2015) suggested levels of place attachment and trust are inherently place-based to a certain extent but also susceptible to policy choices. Their comparative study of five wind farms in Ontario, Canada, found that amendments to the provinces Planning Act, removing land-use decision control from the local municipal governments, proved to be a key factor in host community response to wind power projects. The authors explained that the elevation of approvals to a central authority removed trusted stakeholders from the development planning process and “[standardized] requirements over a large geographic region [ignoring] the importance of individual places to citizens” (p. 32).

2.3.4 Fairness Frameworks

Judgement of trustworthiness and fairness are responses shaped by the processes and outcomes of wind development. Some literature on fairness and wind development

have led to two specific subset of research demonstrating conditional support and opposition: distributional fairness and procedural fairness. Illustrated in the case study by Fast and Mabee (2015), procedural fairness relates to institutional settings and how development decisions are made, the level of stakeholder inclusion, and transparency of the decision-making process. As seen in the Fast and Mabee (2015) study, exclusion from the planning and decision-making processes may lead to distrust in various actors and opposition their proposals. Host community members who perceive the decision-making and planning process as being fair, transparent, informative, and inclusively representative are more likely to accept development, regardless of the outcome (Aitken 2010). Yet, "decision making over the heads of local people is the direct route to protest" (Krohn and Damborg 1999, p. 959). According to Aitken (2010), "perceptions of fairness were also inextricably linked to judgements relating to the trustworthiness of the developers", and benefit promises from developers can be met with skepticism and perceived by community members as bribery schemes to win over the public and avoid opposition (Aitken 2010, p. 6074). In the pilot study of a small rural community in Australia, lack of opportunity to have an equal say in the local submission process resulted in a perceived unfairness of the process and levels of doubt regarding an equitable outcome for the community (Gross 2007).

Distributional fairness concerns the allocation of costs and benefits of wind energy projects and can be grouped into two types of concerns. One is the balance between profits being made by outsiders and compensation afforded to those impacted by development. For example, researchers have found that objectors to wind projects cite the injustice of local resource exploitation while product (energy production) and profits (i.e.,

Gross 2007). The other relates to the distribution of benefits and costs from development among local community members. Promised compensation to offset local costs (i.e., visual impacts, noise, flicker effect, and wildlife impacts) typically takes the form of economic benefits including payments to landowners, increased tax revenues, employment opportunities, and cheaper electricity (Frantal 2015). The perceived uneven distribution of financial benefits is an important predictor of project opposition or support (Walker and Baxter 2017). Frantal (2015), for example, found that more than half of the objectors to a local wind project in the Czech Republic "admitted that they would have supported the project if they or their household had received some direct financial benefit from it" (p. 227). This finding illustrates relative opposition, shaped by "perception of the economic utility of a project for the community" (p. 227). The authors also identified procedural unfairness, specifically insufficient information from developers and local government, as a source of increased opposition. Fairness frameworks explain how perceived unfairness, both procedural and distributional, can induce negative response while damaging a community's social well-being, even dividing a community into what Gross (2007) termed 'winners' and 'losers' in the development process. Gross (2007) identified 'winners' as landowners who would receive payments for turbines and 'losers' as their neighbors who would live in view of turbines but receive no revenue from them (p. 2733). Frantal (2015) identified higher opposition to wind turbines in adjacent municipalities where wind turbines could be seen but "do not derive any direct economic benefit from them" (p. 231).

2.3.5 Expectations

Related to procedural and distributional fairness and perceived equality of benefits, the role of expectations/outcomes can affect public attitudes toward wind energy. Economic opportunity serves as a dominant motivating factor for rural communities to support wind projects (Frantal 2015). Frantal (2015), for instance, recognized "economic opportunity for rural areas has become a popular policy narrative as well as attractive line for developers striving to stimulate local acceptance" (p. 221). Although the role of these persuasive efforts and unmet expectations for informing post-development attitudes toward wind projects are not well researched (Fergen and Jacquet 2016). Peterson et al. (2019) suggested persuasive communication from wind energy supporters and developers about the environmental and economic consequences of their energy choices can have an influence on public attitudes and supportive behavior, particularly in America. But only a few studies have explored the roles of met or unmet expectations in shaping perceptions of wind. In the Czech Republic (Frantal 2015**),** a survey of municipalities found that perceived low economic benefits or 'unfulfilled expectations' was most frequently reported as a negative impact (p. 227). Fergen and Jacquet (2016) explored the role of met and unmet expectations as a factor influencing public attitudes toward and perceptions of wind energy development through a case study of two counties in South Dakota. The case study found that local residents expressed overall positive attitudes towards wind projects after installation despite initial expectations not being met. The study also found that moving turbines were viewed as beautiful when they are perceived as being economically productive. Frantal et al. (2017)

similarly suggested that perceived positive socioeconomic impacts can outweigh the negative perceptions of landscape impacts.

2.3.6 Socioeconomic Factors: Rural Northeast, Midwest, and Great Plains Case Studies

The relationship between socioeconomic factors and attitudes towards and perceptions of local wind power are explored in several case studies conducted in the rural Northeast, Midwest, and Great Plains region. These studies illustrate that in rural America perceived socioeconomic factors often influence local perspectives of wind energy projects. Mulvaney, Woodson, and Prokopy (2013) used a mixed-method approach to reveal widespread support for local wind energy development in three rural Indiana counties. While a few respondents reported negative attitudes towards landscape change, turbines noise, and health issues, respondents were largely supportive of wind farms, primarily for environmental and economic reasons. Wind farms were also viewed as a way to "protect farmland from urban sprawl" (p. 329). Slattery et al. (2012) similarly found high levels of support for wind energy in several Texas and Iowa communities. The study used a mail questionnaire to investigate the perceived socioeconomic impacts of local wind developments. Most respondents expressed very positive views, with 69-percent of respondents claiming that wind farms economically benefited that area through increased tax revenue, employment opportunities, and overall economic activity. Among Texas respondents, socioeconomic impacts were the largest factor influencing public support. Yet, fewer respondents from Iowa felt wind farms generated economic benefits for their community. Only four percent of respondents expressed negative attitudes, citing visual disturbance and noise as the reason.

Another study in West Texas by Brannstrom, Jepson, and Persons (2011) found that public experiences with issues such as tax policy, housing, economic status, and distribution of benefits informed perceptions of local wind development. Specifically, the expected positive benefit of job creation and economic activity for rural areas in economic decline was found to be a key reason for local wind project support. On the other hand, concerns about tax abatement by wind developers, increased rent prices, and uneven distribution of benefits generated strong opposition among some groups that were "excluded from the benefits of wind power because they do not own land with turbines or businesses catering to wind farms" (p. 849). The authors suggested that future perception studies should seek to include such excluded groups and focus on the unequal distribution of benefits and tax incentives offered to the wind industry. A case study in Huron County, Michigan, similarly identified several perceived economic outcomes driving post-development negative attitudes: increased electric rates, uncertainty and unclarity in general, and noise concerns (Groth and Vogt 2014). Specifically, one of the primary sources of opposition related to increased energy costs without clarification on electricity bills. Respondents raised concerns that the cost of installing wind energy facilities was being passed to consumers, in spite of the pre-development promises of cheaper energy. Even individuals who supported local wind energy raised concerns about development not benefiting the local community, as energy was sent to other states. Further, individuals who owned land, and thus could possibly benefit financially, held statistically more positive views of wind energy than those who did not. Jacquet (2012) also found landowners to hold generally neutral or positive views toward local wind development in Northern Pennsylvania. In a survey of 1028 landowners, individuals receiving financial

benefits from employment or land lease payments were more supportive of energy industry activities, despite acknowledging negative impacts such as environmental issues and increased traffic (Jacquet 2012). Those respondents not receiving economic compensation or with no industry employment experience reported more negative views.

2.3.7 Oklahoma-Based Studies

In spite of the state's rapid increase in wind energy development, only a few studies have investigated the perceptions of wind energy in Oklahoma. Drawing from place attachment theory, Reynolds (2012) used a mixed-methods approach to better understand how Oklahoman's attachment to and feelings toward the places they live, grew up, and visit affects their perceptions of modern wind energy infrastructure in the landscape. Reynolds' statistical analysis of survey data for three Oklahoma communities (Ardmore, Norman, and Sayre) found no strong relationship between people's sense of place and perceptions of wind energy. However, more in-depth interviews uncovered several factors influencing opposition and support for wind farms. For instance, the study found that a previous familiarity with man-made structures in the rural setting, specifically oil and gas equipment, lends to people being more accepting of wind energy development. The study also suggested that perceived economic opportunity from energy technology, particularly in rural areas, leads to more positive views of wind energy. Though, people from Sayre, a community familiar with wind energy development, expressed more negative views of wind energy post-development because of experiences with development processes. Several participants raised the issue of noise from wind turbines as a large concern. Overall, perceptions of wind energy and attachment to place where found to be very subjective and vary from place to place, whether rural or urban.

In the host community of Weatherford, Oklahoma, Greene and Geisken (2013) found that 85% of participants from surveys and interviews expressed positive views of wind energy with no evidence of NIMBYism. Specifically, the local economic development manager highlighted tremendous economic benefits. Business owners involved with development (such as hotels and concrete, fencing, and construction companies) cited direct monetary benefits from local development. The authors suggested that "people may have perceptions and awareness of the wind farm but are not well informed about the revenue that is coming into the city from the development" (p. 6).

Specifically, my thesis complements an earlier Oklahoma case study by Samms (2016). Samms (2016) hypothesized that wind energy development in a rural Oklahoma town economically based on the petroleum industry would potentially result in local conflict. The research used a case study of Woodward, Oklahoma, to better understand how pre-existing energy identities impact people's perceptions of new wind energy developments. In his intrinsic case study of the energy community conducted during the summer 2015 and April 2016, Samms employed a triangulation analysis of qualitative data collected from semi-structured interviews, newspaper articles and government publications, and field trip observations to explore perceptions of wind energy development and the local government's claim that Woodward is the "Wind Energy Capitol of Oklahoma" (p. 4). Research participants were selected from a snowball sampling technique and included elite community leaders such as government administrators, local business organization leaders (such as "the head of a local business group responsible for attracting industrial activity to Woodward"), church leaders, and

farmers (p. 46). Results uncovered several perceptions related to economics, community identity and wellbeing, intrinsic value, and environmental impacts. Overall, Samms found participants to hold neutral to positive views about wind energy in the area, while indicating the industry has no conflict with the areas historic oil and gas industry.

Similar to other Midwest and Great Plains case studies, respondents largely boasted the economic benefits for the city from jobs, lease payments, economic activity during wind farm construction, increased tax revenue for local schools and municipal service. In fact, Samms research suggest that although wind energy resulted in less financial benefits than anticipated by community leaders, it provides "a much steadier form of income for the area in comparison" to oil and gas activities (p. 33). However, some negative perceptions still stemmed from experiencing turbine noise, aesthetics, heavy traffic during construction phase, effects on local bats and birds, and controversy over transmission line, specifically payment schemes and eminent domain. Regardless, Samms stated respondents were "willing to put up with these for the benefits of wind power as a whole" (p. 34) and "expressed pride as being the 'hub of the wind energy' and a center for 'clean energy'" (p. 55). Samms (2016) suggests that "as far as Woodward is concerned, further study would help to clarify if the findings of this case study are representative or have been skewed" (p. 66).

Table 3. Summary of case studies on socioeconomic factors and public support for wind energy in rural Northeast, Midwest, and Great Plains communities of the U.S.

Study	Key Findings
Brannstrom, Jepson, Persons (2011) **Study Location:** Nolan County, **West Texas** **Methods:** Q-methodology (a semi-quantitative technique for analyzing viewpoints about a specific topic) using a multi-phase survey of key stakeholders including landowners with wind turbines, government officials, and prominent business and community leaders	The study found that local "placed-based" processes during wind energy development informed perceptions rather than aesthetics, moral values, or environmental concerns. Specifically, public experiences with issues such as **tax policy, housing, economic status, and distribution of benefits** informed perceptions of local wind energy development. The expected positive benefit of **job creation and economic activity** for rural areas in economic decline was found to be a key reason for local wind project support. On the other hand, concerns about **tax abatement, increased rent prices, and uneven distribution of benefits** generated strong opposition among groups "excluded from the benefits of wind power because they do not own land with turbines or businesses catering to wind farms" (p. 849). The authors suggest that future perception studies should seek to include such excluded groups and focus on the unequal distribution of benefits and tax incentives offered to the wind industry.
Groth and Vogt (2014) **Study Location:** Huron County, **Michigan** **Methods:** A mail questionnaire designed to identify social, economic, and environmental factors that inform public perceptions of wind energy	Qualitative analysis of respondents who provided comments uncovered three primary factors driving local attitudes: **increased electric rates, uncertainty and unclarity in general, and noise concerns**. Specifically, one of the biggest factors among those opposed to wind energy related to increased energy costs without clarification on electricity bills. Respondents raised concerns that the cost of wind energy facilities was being passed to consumers, despite the promises of cheaper energy. Even individuals who supported local wind energy raised concerns about development **not benefiting** the local community and energy instead being sent to other states. Contrary to the proximity hypothesis, distance from wind turbines was not found to correlate with perceptions of wind energy (p. 256). Further, Individuals who owned land held statistically more positive views of wind energy than those who did not. This finding is attributed to the possibility to **benefit financially.** Overall, "respondents who support and those who oppose wind energy development find fault with the turbines" (p. 259
Jacquet (2012) **Study Location:** Armenia Mountain region, **Northern Pennsylvania** **Methods:** A survey of 1028 landowners living near wind development and natural gas activities The primary goals were to investigate how proximity to development, economic compensation, and environmental concerns impact attitudes toward wind and natural gas	Overall, the study found landowners to hold generally **positive or neutral views** towards local wind energy development and more negative views toward natural gas development. Those individuals with negative views of both wind and natural gas development expressed **environmental concerns**. **Economic factors** were identified as a key factor of both opposition and support. Individuals receiving financial benefits from **employment or land lease** payments were more supportive of industry activities despite acknowledging negative impacts such as traffic and environmental impacts. Those not receiving economic compensation or with no industry employment experience reported more negative views. The findings challenge NIMBY theory given that **proximity** to wind farms had a minimal influence on resident attitudes toward existing wind farms or planned development. Based on the economic findings, Jacquet (2012) suggests that more widely distributed compensation to non-leasing residents may help mitigate opposition to development.
Mulvaney, Woodson, and Prokopy (2013) **Study Location:** Three rural counties in Indiana **Methods:**	Results revealed widespread support for local wind energy development. While some respondents reported negative attitudes towards landscape change, turbine noise, and health issues, respondents were largely supportive of wind farms, primarily for environmental and **economic reasons**. Wind farms were also viewed as a way to "protect farmland urban sprawl" (p. 329). However, some respondents were opposed to

Mixed-method approach using a mailed survey, stakeholder interviews, and local newspapers and other published reports	wind farm development for aesthetic and place identity reasons, because they moved to the country to escape the city and industrial development.
Slattery et al. (2012) **Study Location:** Several rural host communities in Texas and Iowa **Methods:** Mail questionnaire designed to investigate the perceived socioeconomic impacts of local wind development	Most respondents (72% pre-construction and 76% post-construction) expressed very **positive views**, with 69% of respondents citing that wind farms **economically benefited** the area through increased tax revenue, employment opportunities, and overall economic activity for the community and local schools. Among Texas respondents, **socioeconomic** impacts were the largest factor influencing public support for development. Yet, fewer respondents from Iowa felt wind farms generated economic benefits for their communities. Only four percent of respondents expressed negative attitudes toward wind energy projects, citing visual disturbance and noise.
Greene and Geisken (2013) **Study Location:** Weatherford, Oklahoma **Methods:** Interviews with stakeholders, surveys, and economic modeling	Overall, the study found positive socioeconomic impacts from the adjacent wind farm. The majority of participants from surveys and interviews expressed positive attitudes toward wind energy with no evidence of NIMBYism. The local economic development manager claimed tremendous economic benefits for the community. Specifically, business owners interviewed provided monetary examples of the positive economic impacts to their respective businesses. The business owners interviewed were limited to establishments more directly impacted by or involved with development such as hotels and concrete, fencing, and construction companies (p. 7). For example, a local construction company "benefited with nearly US$300,000 in revenue from the project including building a 5,000-ft^2 operation facility" (p. 7). No smaller business owners were interviewed.
Reynolds (2012) **Study Location:** Three Oklahoma communities, including two rural towns (Ardmore and Sayre) and the urban community of Norman **Methods:** A mixed-method approach	Reynolds statistical analysis of survey data for three Oklahoma communities (Ardmore, Norman, and Sayre) found no strong relationship between people's perceptions of place and wind energy. However, more in-depth interviews uncovered several factors influencing opposition and support for wind farms. For instance, the study found that a previous familiarity with man-made structures in the rural setting, specifically oil and gas equipment, lends to people being more accepting of wind energy development. The study also suggests that economic opportunity from energy technology, particularly in rural areas, leads to more positive views of wind energy. On the other hand, several participants raised the issue of noise from wind turbines as a large concern. Overall, perceptions of wind energy and attachment to place where found to be very subjective and vary from place to place, whether rural or urban. The study included a few interviews with people from Sayre, Oklahoma, a community familiar with wind energy development. These people had negative views of wind energy post-development because of experiences with the industry.
Samms (2016) **Study Location:** Woodward, Oklahoma Methods:	Overall, Samms found participants to hold neutral to positive views about wind energy in the area, while indicating the industry has no conflict with the areas historic oil and gas industry. Respondents largely boasted the economic benefits for the city from jobs, lease payments, economic activity during wind farm construction, increased tax revenue for local schools and municipal service. In fact, Samms research suggest that although wind energy resulted in less financial benefits than anticipated by community leaders, it provides "a much steadier form of income for the area in comparison" to oil and gas activities (p. 33). However, some negative perceptions still stemmed from experiencing turbine noise, aesthetics, heavy traffic during construction phase, effects on local bats and birds, and controversy over transmission line, specifically payment schemes and eminent domain. Despite this, Samms

	stated respondents were “willing to put up with these for the benefits of wind power as a whole” (p. 34) and “expressed pride as being the ‘hub of the wind energy’ and a center for ‘clean energy’” (p. 55).

2.4 GOALS AND OBJECTIVES

The breadth of literature discussed has illustrated the varied, complex, and conflicting findings about social, environmental, and economic impacts (actual and perceived) of local wind energy development. Theoretical debates on perceptions of wind energy suggest a greater need for investigating impacts and perceptions in place-specific contexts. Complexity of local-scale impacts and divided findings further illustrate the need for more case studies and qualitative research to uncover more in-depth narratives from host communities in an effort to better understand perceived impacts. However, very few studies have assessed public perceptions of wind energy in the context of pre-existing energy culture. My study seeks to remedy this gap in the literature.

In particular, my study will further investigate the Oklahoma wind energy debate, specifically to provide greater understanding of the local-scale impacts where projects already exist, and traditional energy industry has long served as the dominant economic base and cultural identity. Utilizing qualitative methods, the goal of this study is to explore the local impacts and factors, both actual and perceived, influencing attitudes towards and perceptions of wind energy in the community of Woodward, Oklahoma. To achieve this goal, this project focuses on the experiences and insight of local community

members, small business owners, and other stakeholders through semi-structured interviews to assess post-development feedback in a host community. Original research objectives and scope were built on the assumptions that positive economic benefits from wind energy would be evident in the community's Mainstreet shopping and business district and built environment. Early semi-structured interviews with business owners and field observations, however, identified alternative themes of local impacts and related perceptions of local wind energy development. As such, this study evolved through a semi-snowball sampling technique to investigate emerging controversial economic, social, and environmental impacts and perceptions in the host community. Objectives were to investigate several factors influencing post-development perceptions of wind energy including the following:

1) Expectations or pre-wind farm economic and development promises of community benefits
2) Pre-existing energy and rural culture
3) Post-installation experiences with industry practices and policy

CHAPTER 3: METHODOLOGY

Inspired by previous wind perceptions studies in the Great Plains region, the research design for this study consists of a qualitative case study to understand the local impacts and perceptions of wind energy in the host community of Woodward, Oklahoma. Qualitative data collection included triangulating the following sources of information: (1) direct field observations, including photography and hand-written field notes from my travels; (2) local narratives from business owners, government officials, and local leaders about experiences with wind energy development using semi-structured interviews; (3) follow-up research to validate and/or further clarify key issues raised by interview participants. Follow-up research included further interviews, reviewing relevant news articles, and examining local records. I chose this "on the ground" case study approach for its ability identifying detailed socioeconomic effects and relationships, which may be hidden or go unnoticed by quantitative, aggregated analysis (Del Rio and Burguillo 2009).

According to Baxter and Jack (2008), qualitative case studies let researchers investigate a phenomenon using a variety of data sources while considering the context within which it is situated. This is particularly the case for wind energy perception research given the geographically diverse nature of impacts and perceptions. As shown in Table 3, some U.S. based studies in the rural Northeast, Midwest, and Great Plains have employed case studies to investigate socioeconomic impacts and perceptions of local wind energy development. Surveys, mail questionnaires, and semi-quantitative techniques are common research approaches. In a West Texas case study, Brannstrom,

Jepson, and Persons (2011) employed a multi-phase survey of key stakeholders including landowners with turbines, government officials, and community leaders. Groth and Vogt (2014) and Slattery et al. (2012) used mail questionnaires to investigate perceptions of local wind energy development. The Northern Pennsylvania case study by Jacquet (2012) surveyed landowners near wind farms. However, only a few case studies have included in-depth qualitative methods such as semi-structured interviews.

Previous researchers have suggested that the complex and place-dependent nature of public perceptions demand case studies employing more in-depth qualitative approaches (Aitken 2010b; Devine-Wright 2005; Devine-Wright and Howes 2010; van der Horst 2007; Petrova 2013). For example, van der Horst (2007) asserted that there is "clearly a need for more in-depth qualitative research to increase our understanding of the social construction of individual attitudes and to explore the tensions between positive social or environmental attitudes in principle and actual social or environmental behavior in practice" (p. 2711). Devine-Wright (2005) also concluded that among wind energy perception studies "there has been an overemphasis upon a single type of research approach," including "market research-oriented, case study design using a quantitative survey tool" (p. 135). Aitken (2010b) similarly criticized widely used opinion polls and survey data as 'unreflectively positivist,' further claiming that these popular methods "ultimately limits [perception literature's] ability to fully understand or represent public experiences with and attitudes towards wind power" (p. 1840). While purely qualitative techniques are limited in that casual relations cannot be interpreted from the results (Devine-Wright and Howes 2010), Devine-Wright (2005) and Aitken (2010b) have

suggested more in-depth, place-based qualitative methods for investigating the complexities of public perceptions and responses to wind energy development.

Oklahoma-based studies by Greene and Geisken (2013) and Reynolds (2012) included stakeholder interviews and surveys. Both studies illustrated how interviews reveal details undetected from quantitative, statistical methods. In fact, according to Greene and Geisken (2013), "any research that is specific to an area or region also requires direct interviews with local officials and wind farm developers" (p. 8-9). The later study by Samms (2016) used a multi-method approach, triangulating qualitative data collected from semi-structured interviews, newspaper articles and government publications, field observations.

Furthermore, although researchers have called for greater understanding of contextual factors influencing, there is a lack of research including, or focusing on, socio-economic and socio-cultural context (Devine-Wright 2005; Petrova 2013; Rand and Hoen 2017). Specifically, Jacquet (2012) indicated that places experiencing multiple forms of energy development (i.e., wind and natural gas) offer researchers unique opportunities to study perceptions. Yet, it is unclear how the existence of other energy development may influence views of wind energy (Jacquet 2012). Only a few studies showcase how pre-existing or coexisting energy extraction activities shape wind energy perceptions (Rand and Hoen 2017).

Jacquet (2012) surveyed landowners living near onshore wind development and natural gas activities in Northern Pennsylvania with the goal of understanding attitudes towards coexisting energy activities in the same context. Jacquet (2012) and the follow-up study by Jacquet and Stedman (2013) found similar attitudes towards the

environmental, economic, and community impacts of wind and natural gas. Yet, wind energy and natural gas projects have been developed simultaneously in northern Pennsylvania, as a result neither studies were deeply rooted in the local energy histories, economies, and cultures.

In Oklahoma, on the other hand, oil and natural gas activities precede wind energy development by a century as the dominant energy source. Hence, Samms (2016) hypothesized that wind energy development in Oklahoma would likely conflict with the pre-existing oil and gas activities and culture. Building on the study by Samms (2016), this thesis similarly seeks to fill the methodological and contextual gap in wind energy perception literature by employing an in-depth qualitative case study using a within-method triangulation (multiple qualitative data collection methods) approach in the traditional oil and gas community of Woodward, Oklahoma.

Triangulation of various data sources and methods was conducted in order to achieve a robust, in-depth understanding of the phenomenon in question (Okafor 2013). I collected information from interviews, news articles and published material, and field observations for a holistic approach to understanding local impacts and perceptions of wind energy development in Woodward. This methodological triangulation approach is often a defining feature of case studies, offering researchers the ability to look at and consider a phenomenon from multiple perspectives rather than a singular levels or view (Denzin 1989 via Fusch, Fusch, and Ness 2018; VanWynsberghe and Khan 2007). In addition to improving research reliability, validity and objectivity, triangulation of multiple data sources also reduces bias inherent in all qualitative research (Fusch, Fusch, and Ness 2018). According to Lincoln and Guba (1985) via Thurmond (2001), “No

single item of information (unless coming from an elite and unimpeachable source) should ever be given serious consideration unless it can be triangulated" (p. 283). Further, "methodological triangulation has the potential of exposing unique differences or meaningful information that may have remained undiscovered with the use of only one approach or data collection technique in the study (Thurmond 2001). As such, triangulation has been advocated by numerous social science researchers as a sensible approach to data collection (e.g., Denzin 1970; Flick 2007; Thurmond 2001).

In the following sections, I provide a brief history of the study area and discuss the details of the methods used in this study. Following the history of Woodward section, this chapter is divided into four sections: (1) research and interview question design, (2) participant sampling technique and interview process, (3) follow-up research, (4) field observations, and (5) data analysis.

3.1 Study Location: Brief History of Woodward, Oklahoma

Located in the northwest corner of the state in the Gypsum Hills region, the community of Woodward has a long, rich history as an oil and gas and agricultural community. Woodward is home to the state's earliest, and still operational, wind energy developments (Figure 6). It is this mixed energy landscape that makes this place intriguing for exploration.

At the junction of U.S. Highways 270 and 412 and State Highways 15 and 34 (Envision Woodward 2014), the city of Woodward sprouted from the sand-sage prairie as nothing more than a cluster of small tent cities (James 1986). The rural community of approximately 13 square miles (34 km^2) serves as the county seat and largest

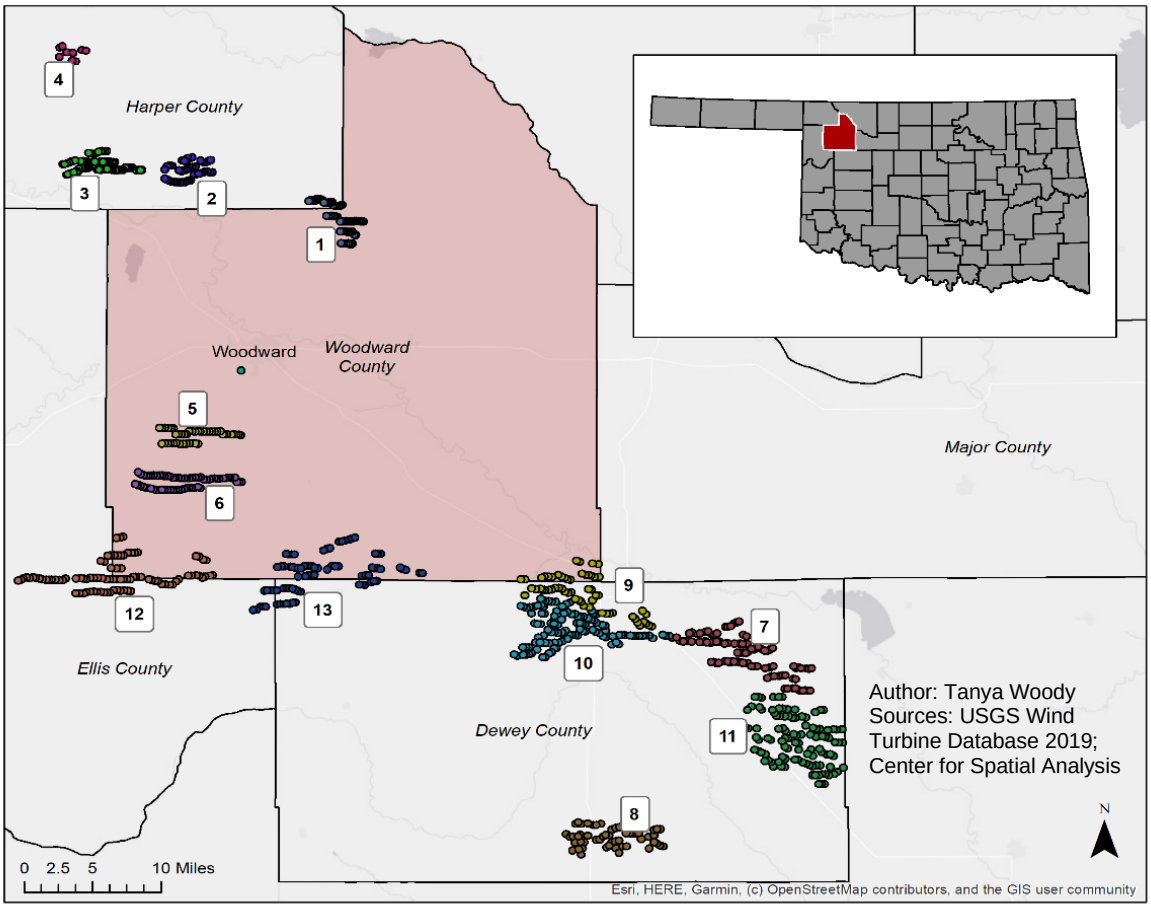
municipality of Woodward County. The population of Woodward was 12,051 according to the 2010 census. The demographic trends in the City from 2010 to 2017 are largely representative of the County. For example, 68% (1074) of the population growth in the County from 2010 to 2015 occurred in the City of Woodward. Both the County and the City experienced population decline after 2015, for a loss of 1116 people from the County (of which 694 were from the City of Woodward). The median household income increased overall at both the County and City-level from 2010 to 2016 with a small decline from 2013. Median household income has declined since 2016 for both the City and the County. Unemployment trends differ between the County and the City. Percent unemployed for the City decreased from 6.2% in 2010 to 3.7% in 2016 and increased to 5.8% in 2017. Unemployment rate at the County dropped from 5.7 in 2010 to 2.5 in 2014, peaked at 6.1 in 2015 and dropped again to 3.4 in 2017. At the city level increase in median household income corresponds with decreased unemployment and vice versa.

These demographic fluctuations can be tied to the area's historic reliance on the fossil fuel industry (i.e., petroleum and natural gas) and its well-marked boom-bust cycles (Meo 2006). In the early 2000s, an" informal alliance among academic researchers, state government agencies, and developers" looked to the Great Plains region for other its other market opportunities (Meo 2006, p. 1). At the state's first wind power conference held in Oklahoma City in 2001, a detailed wind resource map assembled from Oklahoma Mesonet wind data showed over 400 attendees that the relatively flat landscape dominated by open prairie grassland and farmland has phenomenal potential for wind energy production (Meo 2006). In fact, the area's wind power potential ranges from 'fair' to 'excellent,' which is ideal for wind energy production (Meo 2006). The state's first

commercial-scale wind farm development began in Woodward County in 2003 with the construction of the Oklahoma Wind Energy Center (NextEra Energy Resources 2019; White 2016). The county is currently home to nearly 400 commercial-scale wind turbines apportioned among six utility-scale wind farms with an installed capacity of approximately 800 megawatts (White 2016; see Figure 6).[4] Projects wholly or partially within the County boundary include the Oklahoma Wind Energy Center (online in 2003; 68 turbines), OU Spirit (online in 2009; 44 turbines), Keenan II (online in 2010; 66 turbines), Seiling 2 (online in 2014; 59 turbines), Great Western (online in 2016; 63 turbines), and Persimmon Creek (online in 2018; 73 turbines). These and surrounding wind energy projects in the area have been built upon the pre-existing physical, organizational, and cultural infrastructure of the area's unique development history. The town's history presented here shows how economic ebbs and flows in agriculture, petroleum, manufacturing, and mining shaped the community and influenced support for and recruitment of wind energy in the area by local government and development groups.

[4] A vital part of wind power development is the power purchase agreement (PPA) or the long-term contract between the wind farm owner and the energy purchaser. Energy purchasers range from corporate to traditional utility companies. For instance, the Great Western Wind Project consists of 30 V117 wind turbines with 3.3 MW power capacity and 51 V100 turbines with 2.2 MW capacity. The wind farm entered into a power purchase agreement with Google to power Google's new data center in Mayes County, Oklahoma (White, 2016). The project is expected to generate more than $25 million in property taxes for the two counties. Oklahoma Wind Energy Center entered a 20-year power purchase agreement with Oklahoma Gas and Electric Company (OG&E) (White, 2016). Half of the power generated from the wind farm is sold to OG&E, and the other half is sold to Oklahoma Municipal Power Authority.

Figure 6. Wind turbine development around Woodward from 2001 to 2018



Data Source: U.S. Wind Turbine Database (USWTDB 2019). Map author: Tanya Woody

Map #	Project Name	Turbine Count	Year Online	Total Capacity
1	OK Wind Energy Center	68	2003	102.0 MW
2	Centennial Wind Farm	80	2006	60.0 MW
3	Sleeping Bear	45	2007	94.5 MW
4	Buffalo Bear	9	2008	18.9 MW
5	OU Spirit	44	2009	101.2 MW
6	Keenan II	66	2010	151.8 MW
7	Crossroads	98	2011	195.5 MW
8	Taloga	54	2011	129.6 MW
9	Seiling 2	59	2014	100.3 MW

10	Seiling	117	2014	198.9 MW
11	Mammoth Plains	117	2014	198.9 MW
12	Great Western	93	2016	225.0 MW
13	Persimmon Creek	80	2018	198.6 MW

Before describing how Woodward became a wind energy powerhouse, some more context about the place is necessary. Woodward emerged in 1868 along the Great Western Cattle Trail. By the 1880s, the Santa Fe railway network connected Woodward, and it quickly became the regional hub of commercial trade and travel for northwest Oklahoma (Woodward County 2019). During the towns early formative period in the late-19th and early-20th centuries, cattle and agriculture dominated the landscape and served as the primary economic force for the local community (History of Woodward 2019). Woodward became one of the largest cattle shipping locations in the Oklahoma Territory and is home of the state's first commercial-grade livestock auction, which opened in 1933 (History of Woodward 2019). Corn, cotton, broomcorn and wheat were also grown in abundance in the area with wheat becoming the county's primary cash crop by 1914 (Everett 2019; History of Woodward 2019). Between agriculture and cattle activities, the population of Woodward grew to 5,056 by 1930 (History of Woodward 2019).

The agricultural depression after World War I coupled with the Great Depression in 1929 took a toll on Woodward and its neighboring communities, bringing an abrupt end to the community's growth period (Everett 2019). Extractive mining and mineral industry activities in the area (e.g., salt, bentonite, and gypsum) helped to lessen the

economic impacts of the depression, but the community's population only grew to 5,406 inhabitants by 1940 (History of Woodward 2019; Census Bureau 2019).

The town's story of growth and development took a turn in the spring of 1947. On April 9, 1947, the deadliest and strongest tornado in the state's history ripped through the small community, destroying 200 blocks and killing more than 100 people (Everett 2019). Later that same year in October, a devastating wildfire swept through the area ravaging buildings that survived the tornado (OHPS 1996). Despite these tragedies, the population and cultural identity of the community largely survived. The resilient community not only endured but rebuilt and continued to grow, reaching 5,915 residents according to the 1950 census (Census Bureau 2019).

Energy ventures entered the community in 1956 with the discovery of the county's first natural gas well named McCormick Number One. For the next twenty years, economic growth in the area was directly linked to the lucrative oil and gas industry (James 1988). In fact, by the early 1960s, Woodward was home to sixty petroleum related businesses, including Halliburton, Texaco, Amoco, and Marathon (OHPS 1996). Oil and gas drilling activities in the area also lead to the discovery of the world's largest iodine deposit, further diversifying local industry and the economic base. During the energy boom, the population of the town more than doubled from 5,915 in 1950 to 13,610 by 1980 (James 1988).

The streets running through the core of the city stretched westward to the "Oil Patch," where derricks and pumpjacks peppered the countryside. The boom period brought substantial development to the small community including four new banks, a Stock Exchange, the High Plains Vocational Technical School, a new Woodward High

School building, a new post office, a new hospital, and a tree lines Main Street (James 1986). The 1980s oil glut and recession, however, sent oil and gas prices plummeting and fossil-fuel based communities across the west U.S. into an economic tailspin (Black and Ladson 2012). For the first time in the community's history, Woodward experienced population decline that continued for the next two decades (Census Bureau 2019). Even the 2010 census estimating captured only 12,051 residents, showcasing the population never recovered from the large economic hit.

After feeling the effects of economic downturns at the hands of the petroleum market, Woodward city planners and government officials planned to strengthen the local economy by recruiting new industry and services to the area (City of Woodard 2019). Wind energy became an attractive source of potential economic stimulus in the early 2000s as state and federal incentives encouraged large-scale development and advocates illustrated positive economic impacts for host communities. While the fossil-fuel industry still dominates as the city's economic base, the area has seen impressive growth in wind power. Today, wind turbines now share the landscape with petroleum extraction infrastructure, yet the implications of this energy evolution remain unclear.

The City of Woodward's government appears extremely supportive of local wind energy projects. In fact, their local economic development plan features wind energy as a paramount part of the community's broader economic and development goals (City of Woodward 2019). Further, the Woodward Industrial Foundation (2019) promotes wind energy development while seeking to recruit new developer to the area through their brochure linked on the City of Woodward's website (see Figure 7).

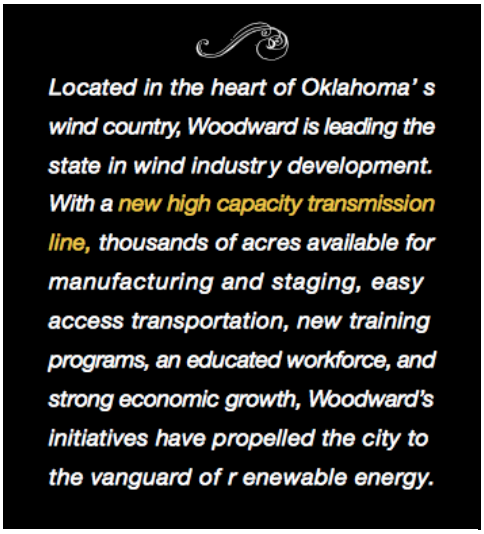


Figure 7. Excerpt from the Woodward Industrial Foundation's wind power brochure

Source: wifok.com

3.2 Methods

3.2.1 Research and Interview Question Design

This study originally began as an examination of the local Mainstreet business and shopping district in the City of Woodward, a rural Oklahoma oil and gas community in juxtaposition to local wind energy development. The primary objective was to investigate the social, economic, and built environment impacts occurring in a mixed-energy landscape. The original goals, scope, and interview questions were developed under the assumption that the rural community, with a long history of oil-and-gas driven boom-bust economics, would be greatly altered by the economic benefits and stability afforded by local wind farm development (as suggested by Samms 2016). The local Mainstreet business and shopping district was selected as a target area of study because

the health and history of a transition economy can be measured by the success of local business ventures and entrepreneurs (Bluestone 2014; McMillan and Woodruff 2002).

Further, the primary method of data collection for this study included semi-structured interviews. While the literature review showed mail surveys to be the most common method of data collection among perception studies, interviews grant a more focused and in-depth exploration of stakeholder experiences and perspectives (Schlegel 2015). Semi-structured interviews further provide a flexible framework for the interviewer and interviewees, thus allowing participants to speak freely about their experiences, while granting the researcher the opportunity to explore unanticipated topics (Schlegel 2015). Further, semi-structured interviews "prove to especially valuable if the researchers are to understand the way the interviewees perceive the social world under study" (Qu and Dumay 2011, p. 246). Thus, I selected a guided interview technique using a set of predetermined core questions that introduce the topic to interviewees and keep the conversation from straying too far off topic but did not limit answers and conversations to a rigid script. According to Holmes (2009), this somewhat systematic technique is both free-flowing and focused in its format. However, this interview guide approach has its weaknesses in that: "important and salient topics may be inadvertently omitted" and "interviewer flexibility in sequencing and wording questions can result in substantially different responses, thus reducing the comparability of responses" (Holmes 2009, p. 94). To limit these inherent weaknesses, I made my best efforts to remain consistent in the wording and sequencing of questions, while also allowing interviewees to bring up additional topics/issues they considered important and go into as much depth as they liked.

Open-ended, semi-structured interview questions were originally designed to explore socio-economic and built environment changes taking place in the community. Contrary to Samms (2016), initial interview subjects of this study were not limited to elite community leaders, government officials, and/or stakeholders directly impacted by nearby development, such as landowners with turbines. Instead, initial interviews were conducted with local small business owners/managers. Business owners were selected as the target research participants because they could provide detailed insight into local economic, social, and environmental changes as it relates to energy development. Interview guides for business owners included twenty questions asking them about their experiences living and working in the community (Figure 8). Questions inquired about participant's insights into economic factors that have influenced their business venture decisions, the history of business performance, challenges they have faced, their perceptions of and experiences with the local economy and local energy industries, and local socioeconomic or built environment changes they have experienced (Figure 8). Later interviews were also conducted with government and community leaders and a local ranch owner who does not directly benefit financially from wind turbines. I also designed a series of similar yet separate questions for interviews with local government and other community leaders. These questions were designed to explore the relationship between energy industries and Woodard's development and economic plans, goals, and experiences over time (Figure 9). All interview questions, associated informed consent forms, and recruitment guidance received Institutional Review Board approval prior to participant recruitment, travel, and interviews.

Figure 8. Interview questions for business owners

1. Business Description (Name, Address, and Year established)
2. Do you own or rent the building?
3. Are you also a local resident?
4. How long have you lived here?
5. How would you describe the changes you have seen in Woodward with regards to the economy, oil and gas industry, wind power industry, Mainstreet/downtown district?
6. Have you changed the location of the business since its original establishment or have you expanded the business to include multiple locations?
7. What was your reason for opening the business at this location?
8. How have your goals for the business changed over time?
9. What challenges have you faced trying to reach your business goals?
10. How do you measure the performance of your business?
11. How would you describe the history of your business performance?
12. What role has the local economy played in your business?
13. What are your plans for the future?
14. Do you see the energy industries (oil/gas and wind) as a sustaining force for your business?
15. How have you seen the local urban environment change?
16. How do you feel about the current and past state of the local economy?
17. How do you see Woodward developing/changing over the next 5, 10, 20 years?

Figure 9. Interview questions for government officials and community leaders

1. Local government position or title?
2. How would you describe the community of Woodward as a place?
3. How has the energy industry impacted the area?
4. Specifically, how has the energy industry shaped Woodward's urban development plans?
5. Did the city recruit the wind power industry to the area?
6. How did citizens respond to the wind industry coming o the area?
7. What kind of conflict, if any, has there been between the petroleum industry, wind industry, and locals?
8. What economic, social, and environmental, issues have the community faced due to the energy industry changes?
9. How have the community's needs and development plans changed?
10. What are the city's economic and community development goals and how do they relate to energy development?
11. What strategies do you propose to address these issues?
12. How have you seen the local urban environment change?
13. How do you feel about the current and past state of the local economy?
14. How do you see Woodward developing/changing over the next 5, 10, 20 years?

After interviews were conducted with several small business owners, the study quickly grew to encompass a more diverse participant base over a larger spatial area after initial interviews and field observations revealed economic benefits and built

environment improvements may not have materialized as anticipated for some stakeholders. Unexpectedly, initial research participants expressed negative perceptions of local wind energy development when asked about the industry as factor impacting the local economy[5]. In fact, they identified pre-wind farm development promises of community benefits as key to understanding their post-development experiences and perceptions. These promises refer to the fairly uniform and widely repeated 'sales pitch' of wind advocates and developers seeking to take advantage of rural lands with excellent wind power potential. As a result, the study evolved to accommodate key topics introduced by initial interviewees, while seeking to identify the major factors driving public perceptions divergent to those found by Samms (2016). To maintain greater consistency and comparability between interviews, I elected to continue using the original interview questions as a guide for all interviews while remaining flexible in its delivery, allowing interview participants to share their own experiences and perspectives, unencumbered by my early assumptions (Creswell and Poth 2016, p. 40).

3.2.2 Sampling Technique and Interview Process

My first efforts to contact potential interview participants followed a random sampling process, including the use of introduction emails and phone calls. First, I collected small business contact information including addresses, phone numbers, and

[5] Any expressions of opinions or views are those of the research participants and do not reflect the views of the thesis author, research advisors, the Department of Geography and Environmental Sustainability, or the University of Oklahoma. Throughout the interview process, I made best efforts to present the views of participants and not my own, by using an active listening process and by honoring participant voices, perspectives, and experiences (Qu and Dumay 2011).

emails (if available) from several online sources including white pages, Facebook, business websites, and the Woodward Chamber of Commerce Business Directory (woodwardchamber.com/business-directory/). Then, I organized a comprehensive list of business owners and contact information in an excel sheet. During the months of December 2018 and January 2019, I emailed and/or called each business multiple times to initiate contact with potential interview subjects and to try to schedule an in-person interview. However, I struggled with recruiting participants as these initial attempts to schedule interviews with local business owners largely failed. Nearly all emails went unanswered after several attempts over the two-month period. Also, I found business owners/managers to be dismissive during research invitation phone calls. Many business owners were either too busy with customers or may have thought I was a telemarketer. Phone call attempts were largely met with the response "No, thank you" followed by a hang-up.

After my email and phone call efforts to recruit potential participants were unsuccessful, I elected to try a face-to-face recruitment approach. I travelled to Woodward several times during December 2018 and January 2019. During my travels, I went door-to-door to local businesses on Main Street, Texas Avenue, Oklahoma Avenue, and 9th Street to personally recruit participants. Potential research participants responded much more positively to this approach. From these door-to-door efforts, five business owners were immediately available for and agreed to the 30 to 60-minute interview (Table 4). These initial interviews with business owners took place face-to-face at each participants business establishment. Prior to face-to-face interviews, participants were asked to read and sign the Institution Review Board approved consent form. I also gave

each participant a copy of the consent form for their records. The consent form introduced the purpose of the study, described why the participant was selected, and clearly explained that there were no risks and no benefits for participating in the study. The form also asked participants for permission to contact them again should I need additional information. Participants were also informed that confidentiality or anonymity was available upon request and asked each interviewee to consent to being recorded, quoted, and cited by name and business in this study and future studies. While all participants agreed to being quoted and cited, they were all extremely apprehensive and uncomfortable about being recorded and did not consent to audio recording. Therefore, I did not record interviews, but instead made my best efforts to take detailed notes during each interview.

Not recording interviews has its advantages and disadvantages for qualitative data collection. According to Harvey (2011), recording interviews provides a verbatim account of the interview, ensuring data quality, while allowing the interviewer to focus on the interviewee rather than note taking. However, recording can also affect the accuracy and depth of responses from participants. This is because participants may be less likely to provide detailed "off-the-record" information in the presence of a recording device (Harvey 2011). On the other hand, "the problem with not using a recording device is that some qualitative data is lost regardless of how fast researchers can write" (Harvey 2011, p. 437). Additionally, writing down responses can interrupt the ability to make observations during the interview (Harvey 2011). Further, according to Mathers, Fox, and Hunn (1998), "In note taking there is an increased risk of interviewer bias because the

interviewer is likely to make notes of the comments which make immediate sense or are perceived as being directly relevant or particularly interesting" (p. 12).

For my study, however, handwritten notes were better than no data at all or pressing for the use of recordings and losing the trust of respondents. All interviewees during this study were helpful during my note taking process, pausing while I quickly jotted down detailed quotes and notes. I made every effort to write down verbatim answers as accurately as possible. In preparation for the possibility that some interviewees may not consent to recording, I had previously prepared printed versions of the interview questions with space for writing down responses by hand after each question. I attached each printed interview guide to a clipboard for writing purposes. This printed guide helped me with writing responses, while maintaining flow and engagement with interviewees. The note taking process did not appear to impede casual, conversational style interviews.

One business owner, Eric Wheeler, was unavailable for an in-person interview but agreed to a telephone interview. Prior to the telephone interview with Mr. Wheeler, I emailed him the consent form for him to read and email back to me. The consent form email also served as a reminder of our scheduled telephone meeting. Similar to not recording, telephone interviews have their own strengths and weaknesses. For instance, telephone interviews can offer a time efficient and flexible method of data collection when "the alternative to a telephone interview [is] no interview" (Harvey 2011). For instance, telephone interviews do not require expensive and time-consuming travel. Telephone interviews are also helpful when interviewees are concerned about anonymity and confidentiality, enabling participants to be more open and honest in their responses

(Harvey 2011). However, telephone interviews also prevent valuable researcher-participant engagement such as shaking hands, making eye contact, and responding to body language and other visual clues (Holt 2010). It is also difficult to identify and respond to cultural differences over the telephone (Holt 2010). Furthermore, "respondents tend to provide less detailed responses in a telephone interview than a face-to-face interview" (Harvey 2011, p. 435).

After my telephone interview with Mr. Wheeler, I found that taking notes was more difficult during telephone interviews. Specifically, a lack of visual cues during the telephone interview made it more difficult for the participant to gauge the speed of my note taking. Hence, my notes were likely less complete compared to previous face-to-face interviews. As a result, for future telephone interviews, I emailed participants a link to answer interview questions through an online questionnaire at least two to three days before our scheduled telephone meeting. After participants answered the questions online, I printed their responses for my review. We then further discussed their answers to each question and other topics of interest during our telephone meeting. This technique (i.e., emailing questions prior to telephone interviews) allowed me to collect better-quality responses from participants during telephone interviews. However, responses from online interview questions send prior to telephone meetings varied in how much time and effort participants put into it. Some telephone interviewees provided thorough, paragraph length answers through the online form, while others only gave short one-line answers to some questions.

While not asked to recommend other research participants, one interviewee stated that I should speak to another local resident and business owner that could offer insight

into specific issues with local wind development. After our interview, local artist and gallery owner, Larry Hill, suggested that I contact ranch and ecotourism business owner, Sue Selman, about her experiences with local wind energy development. While snowball sampling was not originally part of the recruitment strategies, I decided to follow-up on Mr. Hill's suggestion and contact Sue Selman for an interview. While inclement weather prevented an in-person interview with Sue Selman, she agreed to a telephone interview. Again, I emailed the interview questions to Sue Selman, and received responses, prior to our scheduled telephone interview. Sue Selman's extensive experience as a landowner, eco-tourism business owner, and native wildlife advocate required several telephone interviews. Sue Selman was the only participant recruited from a respondent-driven sampling method.

Following these initial interviews with local business, I also created a list of contact information for local government officials and other community leaders. Telephone and email recruitment strategies were more successful with recruiting government and community leaders. After several recruitment emails and phone call to local government and community leaders, three individuals agreed to interviews. These participants included local lawyer and acting Mayor, John Meinders, Woodward Public School Superintendent, Kyle Reynolds, and a local professional who asked to remain anonymous. Unfortunately, inclement weather or schedule conflicts prevented face-to-face scheduled interviews with these three individuals. Instead, all three agreed to telephone interviews. Again, I emailed interview questions and consent forms (and received responses) prior to scheduled telephone meetings for participant review and as a

reminder of our scheduled call. I received each participant written consent prior to each in-person and telephone interview.

Table 4. Study participants

Business Owners/Managers	
Steve Koltz	Manager of Northwest Inn, 3202 1st Street
Larry K. Hill	Artist, owner Larry K. Hill Studio, 715 Main Street, established May 2018; local teacher; resident for 25 years
Kevin Devine	4th generation owner of Devine's Office Supplies, established 1939 on Main Street; moved to 2121 Oklahoma Ave. in 1973; life-long Woodward resident
Patricia Kahn	Owner of Top Cat Formal Wear and Accessories, established 2013, 808 Main Street; life-long resident of nearby Mooreland
Maxine La Munya	Owner of Maxine's Fashion, established 1993, 802 Main Street; resident for 45 years
Eric Wheeler	Owner of Compass Athletics, established 2011, 2024 Main Street; resident for 7 years; chairman elect, Woodward Chamber of Commerce Board of Directors
Local Government	
John Meinders	Owned his own law practice in Woodward since 1997 and currently serves as Mayor of Woodward (since 2017); president of the High Plains Technology Center Board of Directors and president of the Oklahoma Action Resources Center (OARC) Board of Directors
Education	
Andy Evans	Finance Director of Oklahoma Public School Resources Center (OPSRC); former superintendent of Mountain View-Gotebo and Prague school districts
Kyle Reynolds	Woodward native and superintendent of Woodward Public Schools (since 2014); employee of Woodward Public School District for 19 years in various capacities
Landowner	
Sue Selman	Woodward native, owner and operator of Selman Ranch for past 25 years; longtime prairie-chicken advocate; president of Save the Prairie advocacy group
Other	
Anonymous	Local professional

3.2.3 Follow-up Research

All participants that I interviewed were extremely forthcoming and frank about their experiences and the struggles the rural community faces. Their stories uncovered several key topics of concern including the issue of funding for local and surrounding school districts from wind energy development. Additionally, several participants remarked that I should make sure their claims are correct because they were not completely confident that it was true. In order to substantiate claims, follow-up research on the topic/claims included the use of local online news reports and further literature review to either substantiate or provide more details about interviewee claims. For example, one interviewee claimed that he did not think the local public schools benefit financially from nearby wind farm development, but he suggested that I verify that claim. This follow-up research was conducted for several months following interviews. I collected follow-up information from relevant material published from 2001 to 2017. Published material included peer-reviewed academic literature and news articles about wind farm development debates in Woodward and other Oklahoma communities.

Two key topics introduced by participants during interviews included the issues of uneven financial benefits for public school near wind farm development and the potential negative impacts of development on local wildlife. For instance, in and around the study area, optimal sites for wind energy development often overlaps with prairie-chicken habitats (Figure 4), thus raising concerns about the potential negative effects on mating rituals and nesting ecology. Claims on the topic made by landowner, Sue Selman, required additional research from academic and news articles to investigate allegations made about the impacts wind energy development on prairie-chicken habitats.

Additionally, several participants brought up that they did not think financial benefits for public schools from wind energy development was evenly distributed and that some school districts did not benefit at all. I consulted news articles and an additional interview with an expert on the topics to gain further details on these claims. While not originally planned as part of the research design and participant recruitment, follow-up research on this topic lead me to contact Andy Evans, the Director of Finance for the Oklahoma Public School Resources Center (Table 4). Mr. Evans is currently the Financial Services Director for the non-profit organization, the Oklahoma Public School Resource Center. He previously served as the superintendent of Mountain View-Gotebo Public Schools (2010 to 2013) during which a paperwork error brought wind energy development and education funding issues under public scrutiny. Hence, his expertise and experiences offer a unique insight into the impacts of wind energy developments on rural Oklahoma Schools and the state budget. After contacting Mr. Evans by email, he agreed to a face-to-face interview at his office at the Oklahoma Public School Resources Center in Oklahoma City. For this semi-structured interview, I developed an interview guide from comments made by previous interviewees from Woodward and from reviewing news articles about wind energy and public-school financial benefits.

3.2.4 Field Observations

In addition to interviews and follow-up research, I collected data through field observations during my travels to Woodward. Field observations were conducted during three separate trips to Woodward in December 2018 and January 2019. Field observations took place at a range of locations in and around the town including the

historic commercial downtown area, several hospitality venues, and nearby wind farms. I took field notes in a journal and took photographs of relevant landscapes and artifacts during my travels. The downtown business and shopping district of Woodward served as the initial location of observation during face-to-face interview recruitment. The choice of this location for initial observations was based on Robertson (1999), who explains that downtown business, service, and shopping districts provide an ideal view of the health of a city and the urban landscape dynamics taking place. Although compact in area, the downtown area of small North American cities represents not only an immense capital investment over many years, but "they also embody the heritage of a community" (Robertson 1999, p. 270). In fact, Robertson (1999) calls the downtown area the "heart and soul of most small cities," projecting the very identity of the city (p. 270). However, I did not limit my field observations to the downtown area. Given the small size of the community, time and finances allowed me to extend my field observations to another major thoroughfare along 9th Street (also US Highway 270) and to several wind farms west of town.

My field observations of the downtown area and other locations in and around Woodward were inspired by several guidelines for reading a landscape as proposed by Lewis (1979), Mitchell (2002), and Mitchell (2008).[6] These authors present landscapes as embedded with social, cultural, and economic clues that can be understood from "careful observation and inductive reasoning" (Mitchell 2008, p. 29). In his "Axioms for Reading the Landscape," Lewis (1979) characterized the relationship between people and the

[6] I do not attempt to discuss all of the axioms proposed by Lewis (1979) and Mitchell (2008) in this paper. Rather, I have referenced specific axioms most relevant to the findings of this study.

landscape as symbiotic, while laying out guidelines about what we should look for in an American Scene as clue to people's culture. For example, in one of his first Axioms, Lewis elucidates that the setting of our American human landscape "presents an enormous investment of money, time, and emotion" (p. 3). If fact, Lewis claims, "people will not change that landscape unless they are under very heavy pressure to do so" (Lewis 1979, p. 3). When changes do occur, Mitchell (2008) suggests that both technological and cultural changes occur as "great leaps forward" as opposed to gradual evolutions (p. 30). Nevertheless, these changes occur unevenly, leaving clear evidence of that change between the new and the old landscapes (p. 30). Thus, the local landscape is an imprint of both the historic and current culture, values, politics, and economics of a place (Lewis 1979). And, if we do more than look upon it, and instead interpret a man-made landscape for its intrinsic meaning, we can learn much about a community's cultural identity and how it has changed or is changing (Lewis 1979).

More recently, Mitchell (2008) builds on Lewis's axioms with his own interpretation and expansion of the early framework. In his adaptation of Lewis' axioms, Mitchell emphasizes that the landscape is dialectic, illustrating social conflicts taking place between suppressed and powerful actors as a result of social processes and practices. In other words, "any lived-in and produced-in landscape … is a site of struggle" between different actors (Mitchell 2008, p. 38). Further, Mitchell explains that the landscape is actively being made and remade by the social and economic relations of production and consumption. Through this perspective, the man-made landscape in turn represents inclusions and exclusions in the decision-making processes that forge its very change. Energy landscapes are no exception. Man-made landscapes provide a method to

see how energy systems are intertwined with both the "social and physical systems in a spatial manifestation" (De Boer et al. 2018, p. 491). As hypothesized by Samms (2016), the collision of pre-existing and new energy culture may result in conflicts, where land-use and financial benefit decisions are made by elite actors in private boardrooms. However, identifying excluded actors in decisions and conflicts that make a landscape may require both direct (field observations) and indirect (interviews or documents) methods.

Further, while "[c]ontext matters" when making sense of the landscape (Lewis 1979, p. 24), Mitchell (2008) also assert that "[no] landscape is local," emphasizing the role of transient labor and networks of capital and commodities in shaping the landscape (p. 38). This is because although "landscape is produced through investment in it," in our modern capitalist society, investments are rarely composed of completely local means (Mitchell 2008, p. 35). Mitchell uses the example of agricultural in California to illustrate the global networks of capital (from Britain), products of labor (from China, Japan, parts of the US, the Philippines, and Mexico), consumptions (global), as well as theories of development and management and laws that forged a local landscape in Brentwood. He explains that "[t]o understand any produced landscape thus requires tracing out these networks of capital, commodities, and labor networks that have long extended across the globe" (Mitchel 2008, p. 38).

Overall, reading and interpreting the man-made landscape presents the opportunity to understand changes that materialize in the local physical and social fabric and economic restructuring of the city, as well as the community's perceptions of resilience, opportunity, and economic confidence with the changing energy environment.

Any major change in a human landscape is a manifestation of major economic, cultural, or value driven shift of a group of people. However, it is important to consider outside influence (i.e., transient laborers) on the local landscape as key to understanding its meaning. Furthermore, landscape can give clues to conflicts between actors, highlighting power struggles. Additionally, given that wind energy development is touted for bringing economic benefits to host communities, the above discussed frameworks for interpreting the landscape suggests that economic growth would be evident in the local man-made environment.

During my travels to Woodward, I used these axioms as an aid to make sense of the local man-made landscape as an expression of local cultural, economic, and value changes. I specifically focused on four frameworks for interpreting the landscape: (1) landscape as clue to cultural and value shifts, (2) landscape as evidence of economic investment and growth, (3) landscape as dialectic, and (4) landscape as not only local, but a product of complex processes, practices, and decisions beyond geographic location.

3.2.5 Thematic Content Analysis

All data collected from interviews (i.e., emailed responses and my notes from interviews) were analyzed using a thematic analysis technique as detailed by Braun and Clarke (2012). Thematic analysis (TA) is a flexible "method for systematically identifying, organizing, and offering insight into patterns of meaning (themes) across a data set" (Braun and Clarke 2012, p. 57). I attempted to apply primarily a bottom-up inductive approach to coding and analysis of collected data by identifying themes from the raw data itself rather than from existing ideas or topics (Braun and Clarke 2012). This

method allows patterns, categories, and themes to be built from the data "by organizing the data into increasingly more abstract units of information" (Creswell 2016, p. 38). However, as explained by Braun and Clarke (2012), coding and analysis of qualitative data often combines both inductive and deductive (i.e., using a set of concepts or ideas to interpret the data) approaches because "[i]t is impossible to be purely inductive" (p. 58). A researcher always brings some preconceived ideas when analyzing or coding data (Braun and Clarke 2012). Still, I aimed for an objective and inductive approach to identifying themes.

I used a manual approach to identify themes that emerged from the text (Braun and Clarke 2012, p. 60). First, I spread all the hard-copy texts and notes out on my living room floor and "[immersed] [myself] in the data by reading and re-reading" emailed responses from participants, my notes from interviews, and follow-up research line-by-line. As themes emerged from the text, I organized and coded the themes from my notes using different colored markers to underline the relevant text and provided a descriptive name to represent each theme. Ryan and Bernard (2000) highly recommend this method of "pawing through texts and marking them up with different colored highlighter pens" (p. 8). During this manual color-coding process, I discovered themes by analyzing text for a combination of key words, word and phrase repetition, key-words-in-context, and comparative and contrast approaches (Ryan and Bernard 2000). I repeated this process until all text relevant to each code/theme had been collated. I then reorganized the color-coded text by rewriting the text and its reference separate posters where each poster represented a theme. Next, I "[explored] the relationship between themes … to consider how the themes [worked] together in telling an over-all story about the data" (Braun and

Clarke 2012, p. 65). Following what Ryan and Bernard (2000) call a scrutiny-based technique, I also looked for themes that were missing from the text I had collected by comparing the themes I uncovered to themes identified in previous literature.

Throughout my analysis, the interview data were triangulated with field observations and published material when possible to validate participant responses and provide a detailed narrative of local experiences with, and perceptions of how wind energy development has impacted the host community of Woodward, Oklahoma. This process of "pawing" over and interpreting the meaning of qualitative data uncovered four key themes: (1) physical and charitable presence in the community, (2) economic instability, (3) uneven local benefits and tax avoidance schemes, and (4) green-on-green contradiction. In the following chapter I present and discuss the central themes of this research.

CHAPTER 4: RESULTS

4.1 Field Observations and Interviews

Figure 10. OU Spirit Wind Farm, Woodward, Oklahoma



Photo by Tanya Woody, 9 January 2019.

Traveling on State Highway 3 into northwest Oklahoma, towering wind turbines turning on the windswept prairie landscape are an awe-inspiring sight. Standing approximately 213 feet above the ground, the seemingly slow rotating blades fill the skyline in nearly every direction (Figure 10). Encompassed within this scene lies the city

of Woodward, the heart of Woodward County. The community is a major travel stop along State Highway 3, the longest state highway in Oklahoma. While the huge white structures fade in the distance as one enters the Woodward City limits, they never seem to be truly out of mind.

Presenting an air of wide-spread community acceptance, admiration, and civic pride for the new local commodity, scenic views of turbines emerging from the rural sagebrush countryside grace the walls of nearly every local establishment I visited. For instance, the lobby and hallways of the Northwest Inn, where I stayed for nearly a week during my visit, proudly exhibit massive photography capturing their energy rich landscape (Figure 11). Local artist and teacher, Larry K. Hill, showcases his renditions of the local vista through oil on canvas in his downtown gallery, where the wind turbines now reflect part of life on the plains (Figure 12). These serene reflections of the towering, twirling turbines emerging from the landscape, however, do not evince the broader community experience with the industry over the past 17 years. I quickly discovered that the initial facade of a rural town being reinvented by investment in wind power and a new diversified economy fell away as I gained a better understanding of the community, the people, their culture, struggles, and perceptions.

First and foremost, it was directly evident that the fossil fuel industry still reigns supreme as a powerful place-shaping agent and local economic driver. The first clear indication of this realization came when trying to find a vacant hotel room. While the small, rural town hosts 13 hotels and inns, most of these accommodations were filled to the brim on any given evening, not so much by tourists or travelers but by transient oilfield workers.

Figure 12. Photo of wind turbine displayed in the Northwest Inn lobby



Figure 11. Oil on canvas painting by artist Larry K. Hill



In the early morning hours along hospitality row, also called Williams Avenue, hundreds of men from oilfield giants, such as Halliburton, all emerged from local lodgings clad in grey and red utility jumpsuits. Rolling hefty storage totes behind them, they could be seen piling into white, heavy duty pickup trucks with company logos on the side. In fact, during my stay at the Northwest Inn, I would estimate that 90 to 95 percent of the rooms were occupied by oilfield workers. This activity significantly impacts local urban growth patterns, particularly along the highway artery that runs north through the town as Williams Ave and 9th Street and then heads west on Oklahoma Avenue. New

hotels, restaurants, gas stations, and other businesses have been built along this main highway thoroughfare to accommodate the transient populations.

The local manager of the Inn, Steve Koltz, told me that at the very least 30% of their business is from the oil and gas industry. Steve also claimed that "the industry has a huge impact on hotels and restaurants here" and "any bust [in oil and gas] will hit them the hardest, but then will send a ripple effect through the city because of decreases in tax revenue." When asked how local wind power has impacted the community and its economy, Steve portrayed the industry as "more of an unseen presence," stating "I just don't see it as a big economic factor." Surprisingly, Steve painted wind energy production as no more than just another "boom and bust industry" itself, bringing economic growth to the area only when new wind farms were being built. But, Steve said, "that has all died down, and we just don't see anything from that industry now." These three unanticipated sentiments (i.e., wind energy's lack of presence in the community, the unmaterialized economic benefits, and it being just another boom-bust industry) became recurring themes during my visit as they were shared in some form or another by nearly every business owner to whom I spoke.

Arising from years of acquaintance with local economic and livelihood struggles, business owners and other locals were not particularly full of collective pride for or optimism regarding local wind energy development. They also were not as embracing of their City's clean energy vision the way the municipal government may exhibit. While the current mayor, John Meinders, claims that: "The local citizens for the most part recognize the value and importance of both [the petroleum and wind industries] and try to work with them," discussion of the shortcomings of local wind energy projects was very

common during my visits. Ranch owner and eco-tourism enthusiast, Sue Selman, summed up her nearly twenty years of experiences with local wind projects by saying:

> The wind industry is very slick and skilled at moving into a community. They go to the local [Chamber of Commerce] and organizations such as the Woodward Industrial Foundation. They spin their quiet lies well and win over these kinds of organizations. They convince the community that this will be a big help to the local economy, but it is a lie. At first, most people thought wind farms would be a good thing, but as time went by, the mood has changed greatly.

Other interviewees shared similar stories and frustrations with local wind power enterprise.

In the following subsections, I present the results obtained from these interviews through common narratives identified from participant stories. The subsections are divided into four parts, each addressing an explicit theme illustrating social, economic, and environmental concerns: local industry presence; impacts on economic stability; controversial tax issues and the effect on public school funding; and conflicts with wildlife conservation efforts and prairie livelihoods.

4.2 Presence in the Community

Wind developers and local government tout wind energy projects as an economic catalyst for the rural community (e.g., Blue Canyon Wind Farms 2019; Competitive Power Ventures 2019; NextEra Energy Resources 2019; Woodward Industrial Foundation 2019). It is widely recognized by Oklahomans that the leading energy industries contribute largely to the state's socio-economic development and cultural

identity. The business owners I spoke with, however, argued that the proposed developmental benefits of wind energy are not materializing for them as anticipated. Steve Koltz, the manager of a local inn, measures economic strength and community success based on the number of patrons that stay at his inn. Similarly, small business owners with shops located downtown estimate their financial state and the local economic welfare based on the number of shoppers frequenting their establishment and, most importantly, repeat customers. Business owners emphasized a desperate need for local industry to have a social presence within the community, describing it as key to keeping small businesses and the downtown area afloat. Unlike the oil and gas industry, the wind industry in Woodward is largely invisible in the community, and small business owners were more than happy to talk candidly about their experiences, perceptions, and struggles. Interview participants alluded to the issue of community engagement by industry in two separate ways: (1) physical presence (i.e. workers with uniforms and trucks with logos, employees and their families shopping) and (2) monetary support through donations for community improvement and projects.

Maxine La Munya is a longtime resident and owner of Maxine's clothing store for women in downtown Woodward. During our interview at her Main Street store location, she stated firmly that "the wind industry here is not involved in the local community at all, it does nothing to help our local businesses" and "the people making lots of money off of that industry don't reinvest back into the town's economy." Having lived and owned small businesses in Woodward for over 45 years, Maxine explained that those directly involved in wind farm development, including developers and land owners, are

indeed growing extremely wealthy, but these "rich people in their nice SUVs with lots of money do not shop here, they go to Oklahoma City or even farther to do their shopping."

Patricia Kahn, owner of Top Cat Formal Wear, testified to similar observations, asserting that the wind industry "only helps the farmers …, but there haven't been any changes in town." Confirming Maxine's claim, Patricia said that one of the biggest challenges she faces as a business owner is the fact that "all those people making money go to the city to shop," and she has "never seen people from the [wind industry] around in uniforms or trucks." In fact, Patricia described the wind company's presence as so minimal that she "forgot [the turbines] were even out their until [I] started asking her questions about them." Local artist, gallery owner, and teacher, Larry Hill, added:

> I am aware of [the wind power industry]. I know they are here. It just does not impact us. Oil guys spend a lot. They make the money and they spend it, locally. Oil fields drive all the business around here, and legislatures are approaching this all wrong as far as taxes on the oil and gas.

Business owners also mentioned that not only have they not experienced shoppers related to wind energy development, but none of them knew a single person currently employed by, or ever employed by, the wind industry. For example, Patricia mentioned "this is a small town and people know each other, but I don't know anyone employed by the wind companies." Eric Wheeler, owner of the local sporting goods and team uniform store called Compass Athletics, made a similar statement: "People think these large wind farms have hundreds of people working at them. That isn't the case." Kevin Devine, whose family has owned the local Radio Shack since 1939, added: "It just doesn't take as many people to run a wind farm."

Through further investigation into the issue of local wind industry employment creation, I found that one of the largest owner and operators in the area, NextEra Energy Resources, headquartered out of Juno Beach, Florida, employs a staff of seven people, although their website did not specify if those seven employees were local residents (NextEra Energy Resources 2019). EDP Renewables states that Blue Canyon Wind Farm has created 64 permanent jobs for the host community (Blue Canyon Wind Farm 2019). Additionally, the Woodward community is home to a technical school for training wind industry employees and a Siemens wind service warehouse. Regardless, business owners do not 'see' these employees frequenting their stores or spending in the community.

In addition to not having a physical presence in the form of local employment creation, local contracting, and local spending, these business owners further added that the wind industry is not engaged with the community like the oil and gas companies, for instance, through financial funding for improvement projects. Patricia claimed that when the Woodward Arts Theatre needed renovations, the theatre council went straight to a local oil service company for financial help. Eric Wheeler confirmed: "You also don't see the wind companies involved in the community like you see with the oil and gas companies." Larry Hill also echoed this sentiment:

> It is the oil and gas companies that fund community projects. Donations for upgrades to some of the old downtown are from oil and gas companies. The wind promises are a little false. They are only here because of our geography and have little interest in the community beyond that.

This affirmation runs contrary to the claim of one local energy company. Competitive Power Ventures says they are "an active partner in the Woodward community," clarifying:

> CPV has contributed thousands of dollars annually to a wide array of non-profit organizations and events including local fire departments and academic fundraisers, the Future Farmers of America Premium Auction and the Woodward Elks Rodeo, as well as key local family service programs and other worthwhile community support groups. (Competitive Power Ventures 2019)

This issue of community presence related to employment creation, community spending, and community involvement was not only mentioned by each business owner but was also one of the first things to come out of each interview when I asked about the local influence of the wind industry. Like a town in a biodome, the presence of the wind industry clearly lies beyond the extent of the community's borders from the perspective of a small business owner. The U.S. Department of Energy WINDExchange Community Impact web page conveys a "proper sited wind project" as important for coexisting "within the community with minimal intrusion." The small business interviewees, however, value a presence of local energy industries in their town and associate this absence with the wind industry failing to benefit their business and the community as a whole.

These expectations are rooted in comparing the wind industry enterprise to traditional fossil fuel industry practices, albeit a few interviewees indicated that the tendency to look for similarities between the two industries is flawed but did not offer much more clarification. For instance, Larry Hill claimed it is like comparing apples to

oranges, and “it is unfair to compare them, they are two different beasts.” With a slightly more pro-wind disposition, Kevin Devine made a similar comment, saying: “We sit and compare it too much to the oil and gas industry… it is a different animal.”

Regardless of this awareness, participants went on to make another, often overlooked, correlation between the impacts of wind energy to oil. All too familiar with the local-scale booms-busts cycles of traditional oil and gas markets, a prominent dialogue that spurred from interviewees suggests wind energy projects produce a similar boom and bust effect for the local economy.

4.3 Economic Instability: Boom and Bust Cycles of Wind

As discussed earlier, the wind industry is often praised as an excellent opportunity to help rural communities struggling with limited or unstable local economies (Haggerty et al. 2014). A *Tulsa World* article from February 2015 discussed such claims by quoting Stephen Stadler, an Oklahoma State University professor and official state geographer. Stadler stated: “Construction alone can pump tens of millions of dollars into a rural economy, and the benefits will be felt for many years to come” (Overall 2015). Woodward Mayor, John Meinders, insists wind energy certainly acts as a stabilizing force for the local economy through money paid to landowners, more jobs, and more use of local services. Yet, Woodward locals I interviewed have not witnessed this newfound source of long-lasting economic security. Instead, they explained how wind power development brought a similar boom-and-bust cycle to the local economy as oil and gas.

Participants clarified that the boom period was experienced during early wind turbine construction periods, followed immediately by a bust period. Larry Hill best portrayed the wind driven boom and bust when he stated:

> Building the wind turbines brought a short-lived inflation to the local economy. When they first started building them, it took a lot of time and manpower to build just one. But then they got faster, and once they were built, those jobs and the economic revenue were gone quickly, leaving the community in a bust period very similar to an oil bust. (Larry Hill)

Though Kevin Devine had a slightly more positive attitude toward the wind industry, saying: "I think it has helped us a little," he admitted that the new industry brought an economic turbulence to the area:

> The votech has brought in some people, but it has had little impact. [The economy] is good when they are building towers, brings in more people to the town. But, once they are built, those people move on. (Kevin Devine)

Although Patricia Kahn has only owned her formal wear shop for about five years, she was born and raised in the nearby town of Mooreland and also worked for Woodward Diesel Parts and Services for over 11 years. She told me that during her time living and working in the area she has had a front row seat to the region's many energy induced boom and busts, asserting:

> Business was awesome during a boom, and the wind is the same as oil, once they are done building, those workers move on. It is not steady like a permanent manufacturing industry and is not a stable source of employment. We need businesses that are here to stay and are reliable. (Patricia Kahn)

Even a local professional (who asked to remain anonymous) agreed with the wind driven boom and bust. They said that while they are glad that the town has the industry as a means to diversify the local economic base, "the business community appreciated the construction phase of the wind farms and transmission lines, but since then, the wind industry has had little effect on the town in general." A local ranch and eco-tourism owner, Sue Selman, expressed the most contentious sentiment about the local impacts of the wind industry, stating:

> I think the wind industry has little positive impact on the area. The wind industry greatly exaggerates the number of jobs they will provide … they brag about the number of jobs … but most of those jobs are only during the construction. They conveniently forget to mention that almost all the construction jobs are people brought in from out of state that specialize in this type of construction.

As a community quite familiar with the cyclical nature of energy industries, Woodward business owners and other locals recounted that the wind industry not only created its own economic fluctuations but also has not helped to stabilize the local economy. Even the local Mayor recounted that the community as still facing the challenges of "boom and bust economics, from having everything crowded during the boom to empty industrial yards currently" (John Meinders). As the following quotes illustrate, other participants also argued that the community continues to experience the ups and downs of a traditional oil and gas economy:

> Larry Hill: "It continues to be cyclical. It's the same old story. When its up its wonderful, when its down it's not."
>
> Kevin Devine: "The economy here cycles as always. I have watched the peaks and valleys and it is still up and down."

> Kevin Devine: “I’ve been in business for over 40 years. And, I don’t have a good feeling about the future. Owning a business is more difficult than even, with or without a new energy industry.”
>
> Patricia Kahn: “Wind energy does not affect me. I cannot tell a difference in what [the wind industry] is supposed to offer the community. [The community] is not growing. No new restaurants, and a local steakhouse just closed down… Weddings are big tell that the economy is down right now. People are not spending as much; they are going for less extravagant weddings.”
>
> Eric Wheeler: “Downtown continues to struggle in Woodward. Some of that is due to the local economy … but the northwest Oklahoma economy has been a roller coaster forever. Times are good and people think it will last forever. Times get bad and they think it is the end of the world.”
>
> Maxine La Munya: “The economy has been very bad for the last four years. The local economy is just not stable currently and everyone is struggling.”

The anonymous professional claimed that one of the city’s main economic and community development goals was to “diversify away from oil and gas production as much as possible.” The local economic volatility, however, emanates from the fact that despite wide-spread wind power development, conventional oil and gas still reigns supreme as the community’s primary economic source. In today’s economic climate, where employment opportunities are paramount, interviewees said it is the oil companies providing jobs in rural Oklahoma. For example, Patricia Kahn commented that: “Local kids coming out of high school go into the oil because it is good money… the oil field pays well and has good benefits. Woodward will always have a strong oil field presence,

always has, always will." Similarly, Larry Hill proclaimed: "The wind will never be able to employ what the oil and gas industry does here."

In a recent 2020 article, journalist William W. Savage III echoed the sentiments of the people I interviewed about the local energy economy (Savage 2020). Savage interviewed the president of the Woodward Industrial Foundation, Alan Case, who confirmed that even the economic downturn from the novel coronavirus pandemic of 2020 cannot compare to the strife of living with the ups and downs of an energy economy (Savage 2020). Savage quoted Case as saying "I think if you interviewed 100 people on the street corner and said, 'Which is worse: The economic downturn or COVID-19?' I think 95 people would say, 'The energy economy'" (Savage 2020). Case further said that when oil prices plummeted in 2014 the City of Woodward "[lost 40 to 100 jobs] at a time for two and half to three years, and it resulted in a negative migration of about 4,000 people out of Woodward" (Savage 2020).

4.4 Where the Wind Blows: Uneven Local Benefits and Tax Avoidance Schemes

Although not directly asked, a number of interviewees discussed another aspect of concern involving the uneven costs and benefits of local wind power development projects. Some participants, for example, questioned the allocation of energy produced by the farms and the supposed financial support that the wind industry provides to the city. The leading topic of concern for many interviewees was the issue of ad valorem taxes and local wind company tax avoidance that influence local school funding. Interview participants reported that some nearby towns, such as Fort Supply and Seiling, benefit much more from their nearby wind farms than the City of Woodward, particularly when

it comes to local school districts. Larry Hill explained that the wind industry does not serve as a stabilizing force for the local economy because wind farms only contribute to the revenue flow through the ad valorem tax base. Sue Selman shared a similar testimonial, stating:

> There is the issue of their ad valorem that was paid for the first five years by the state until 2017. The wind industry lied about how good they are for the schools, when it was the taxpayers paying their taxes. A huge problem is the double depreciation they now have that has really hurt schools and some towns.

To clarify, property taxes are the primary source of revenue for rural communities and school districts in Oklahoma. Federal and state level financial incentives and subsidies have been essential to the success of wind energy development across the country (Schumacher and Yang 2018). For instance, tax credits to support renewable energy investments range from several Federal Production Tax Credits to the Oklahoma Zero Emission Tax Credit (Windfall Coalition 2016). A key incentive impacting wind farm host communities is the state property tax exemption for wind generators (DSIRE 2019). Established 1985, Oklahoma voters passed State Question 588, providing a 100% property tax exemption for five years for qualified research and development projects. The bill applies to all wind projects constructed before December 31, 2016. The U.S. Department of Energy WINDExchange states: “Property tax payments from utility-scale wind projects provide much-needed revenue to rural communities for building new roads, schools, bridges, and other community infrastructure” (DOE 2020b). As an ad valorem tax exemption, however, the state is required to reimburse local school districts, counties, and local municipalities for the lost property tax revenue they should receive from the

wind projects in their area during that five year period (Monies 2015). Oklahoma taxpayer income and other tax payments still provide the funds to make these tax payments on behalf of the wind farm companies.

Indeed, it is important to note that wind farms are not the only companies taking advantage of this program. Established over 30 years ago, the property tax exemption from State Question 588 also grants the same exemption to qualified manufacturers such as electric power plants, data research centers, and distribution centers (Monies 2015). Such exemptions have cost the state and its taxpayers millions, if not billions, of dollars. A 2016 article by National Wind Watch claims the state has paid over "$144 million on behalf of wind farm owners under this program [in just 10 years]," taking the lead as the largest recipient group of the property tax exemption. In 2018 alone, 45 percent of total ad valorem tax exemption claims were on behalf of wind energy companies (Oklahoma Policy Institute 2019). Interestingly, tax breaks afforded to oil and gas industry cost the state close to $400 million in 2017 (Blatt 2017). But the state eventually conceded that wind power had moved beyond the infancy stage of development, abolishing the ad valorem tax exemptions for wind farms developed after 2016. Even after this five-year exemption expires for wind energy projects, however, wind farm property-value assessment debates still significantly impact the amount of revenue intended to benefit rural school districts.

Financial Director for the privately funded Oklahoma Public School Resource Center (OPSRC), Andy Evans, is charged with the complex task of estimating and forecasting property tax revenue for school districts and offering financial consulting to districts. Andy depicted the process of trying to assess the wind farm apportionment of

property tax revenue is “like trying to hit a moving target,” adding that “any positive benefits to the communities are being diluted by lease payments to absentee landlords, and more importantly, the negative impacts of an accelerated property tax depreciation schedule.” The chief difficulty for Andy stems from the valuation of moving parts on turbines and the rate of depreciation, as well as property-value appraisal protests made by wind farm owners. Termed “double deprecation,” moving parts on wind turbines (i.e., gears and blades) depreciate in taxable value on a 12-year schedule, while other stationary parts (i.e., towers) depreciate on a 25-year schedule. Compounding the issue, wind farm owners argue that depreciation on moving parts begins even while parts are being stored on the ground (Rust 2015). As a result, Andy questioned: “When these wind farms get to the 12th and 25th-year of this depreciation, what value are they to the local communities that they made promises to?”

The tax debates surrounding wind farms have profound consequences for communities and schools across the state. Local school districts across the state have been battling both the state and wind companies after losing much needed funding to tax exemptions and tax debates. Andy’s experience goes back to 2011. Before taking over his current position at OPSRC, Andy served as the superintendent for Prague and for Mountain View-Gotebo school districts. During his time at Mountain View-Gotebo in southwestern Kiowa County, Andy suddenly found himself fighting to get the ad valorem funds owed to the small school district and struggling to make payroll. Hosting 84 wind turbines owned by the Houston-based Horizon Wind Energy company, the school district received these funds annually since the Blue Canyon II wind farm became operational in

December 2005. But in 2011, the last year of state reimbursed ad valorem tax break for Blue Canyon II, Andy's district did not receive the nearly $500,000 they were owed.

A lengthy and painstaking investigation on behalf of Andy and his fellow school board members traced the issue to a clerical error somewhere between the county and the state Tax Commission. No one took responsibility for the error, forcing the district to sue the Oklahoma Tax Commission on August 1 (an extended interview with Andy Evans by The Oklahoman can be found at https://youtu.be/FZXf4kp4zvM). The case made its way to the state supreme court where the school district petitioned that either the Tax Commission reimburse the ad valorem taxes owed to the county or Horizon Energy be required to pay the property taxes. The court ruled in favor of Mountain View-Gotebo, ordering the tax commission to pay the taxes owed to the county. Despite the win, Andy professed that from that point forward he was "always in fear that the state wouldn't pay." He further told of how the incident affected him: "You always know you are just one paperwork error or tax protest away from a financial crisis." Drawing on this and his experiences researching wind farm tax debates since then, Andy fears that "within the next seven years we will have a serious state aid problem because of wind."

While the Mountain View-Gotebo case resulted from a no more than a clerical error, other school districts in Oklahoma have found themselves faced with what they considered deceptive and intentional tax avoidance schemes by wind companies. More recently, public schools in northern Kay and Grant Counties spent over a year battling "an elaborate business and legal strategy [by Rock Falls Wind Farm LLC] designed to avoid paying property taxes on its 154-megawatt wind farm" (Ellis 2018). The tactic involved a transfer of ownership and land lease rights to the Blackwell Economic

Development Authority (a municipal public trust), who then subleased the wind turbines and land back to Rock Falls. The agreement with the municipal trust made the wind farms tax exempt. After a series of lawsuits and counter suits by Rock Falls and Kay and Grant County, Rock Falls eventually withdrew their claim of tax exemption. Still, Newkirk Superintendent Brady Barnes worries other wind companies will try to use a similar tax avoidance strategy (Ellis 2018).

Local Woodward teacher and artist, Larry Hill, expressed similar concerns regarding wind company property tax avoidance issues, stating: "Schools here with wind farms in their district are not benefiting because wind farms are getting out of paying taxes, and then the schools go completely unfunded." He clarified that I should fact-check his claims, so I investigated tax records for local wind companies in the area. I first tried to investigate taxes paid by local wind farms through the Woodward County Treasurer and Assessor, but quickly ran into a roadblock, as I was unable to locate property tax records for all wind companies operating in the area. Even with over 250 turbines in Woodward County and 49 turbines in the City of Woodward school district, Woodward Public Schools receive zero tax benefits from the local wind projects, including from the Ad Valorem Reimbursement Fund. It was not until I contacted the Woodward public school superintendent, Kyle Reynolds, that I discovered the local public schools do not receive tax benefits from wind farms because the owner and operator of the turbines in their school district are completely tax exempt. Kyle Reynolds said:

> My district encompasses a large part of a wind farm north of town, but it was sold to OMPA (Oklahoma Municipal Power Authority),

> a tax-exempt organization immediately after being built. We do not benefit from any revenue generated by the wind farm.

He also proclaimed that the wind farm north of town made promises of benefits to the community but then immediately sold the farm after construction was complete. Kyle explained that this is not the case for other nearby school districts. For example, he stated that: "Fort Supply has a wind farm north of town, and they went from rags to riches." But the prosperity was short lived. Kyle asserted:

> Depreciation has resulted in a travesty for those communities. After passing a new bond for the new school building, they have had to pretend like the money from wind is not there because soon it won't be. In just eight to ten years down the road, the money from wind will not be there, and those schools will be back on state aid.

Kyle is generally in favor of wind power; however, he expressed disappointment that his family missed out on the opportunity to host a wind turbine on their land, citing that he would have agreed to it for the monetary benefits. In one of the few positive statements about wind power, Kyle also commented that he "[likes] the way the wind industry diversifies the economic and local industry" by bringing a premier technology school and Siemens wind turbine manufacturer to the area. Another participant, on the other hand, was significantly less enthusiastic about the impacts that wind energy development has brought to the area. Instead, landowner and wildlife conservationist, Sue Selman, argues that the technology itself threatens local species and her rural lifestyle.

4.5 Threats to Native Wildlife and Livelihoods: Green-on-Green Contradiction

Sue Selman is the third-generation owner and operator of the historic 14,000-acre Ranch established in the late 1800s near Buffalo in Harper County and north of Woodward. Sue grew up on her family's ranch, then left for many years and moved back 24 years ago. Since returning home, she has passionately fought to protect the prairie landscape and as a member of Oklahoma Wildlife and Prairie Heritage Alliance (www.owpha.org) serves as a longtime advocate for native wildlife conservation and habitat protection. Sue Selman's memories of growing up on her family's ranch have been chronicled in the book *Buffalo Creek Chronicles: Diary of a Cattle Ranch on the Southern Plains* coauthored by Gary Lantz and Don House. While wind farms have been praised as an economic boost for farmers and landowners hosting turbines on their land, Sue could not put a price on the prairie and her family's livelihood. Still, she found herself living in the shadows of turbines, fighting the encroachment of development, and striving to raise awareness about the consequences of prairie habitat destruction.

During our interview on 26 February 2019, Sue began by making it clear that she use to be a strong supporter of renewable energy, stating "I even have a subscription to *Mother Earth News*." In the face of this affirmation, she cannot support wind energy after "[seeing] what they are doing to the land" and witnessing "the hordes of lies [wind companies and advocates] all told." In chronicling the evolution of community response to wind power, Sue explained how time and experience has also caused many other members of the community to reconsider their stance on local development, stating:

> The more and more wind farms coming in has changed the [way people feel about the wind industry]. They are unsightly, noisy, sling

> ice, catch on fire and create [wildfires]. They require transmission lines which use eminent domain to take away land from unwilling landowners. When the wind industry first [moved in] it was almost like treason to dislike them but now, I would say, except for landowners making money from them, the majority of [locals] hate them.

Sue's position on wind power in the region builds on her family's legacy hosting educational eco-tourism tours as well as seasonal hunting and fishing at her guest ranch. For decades, hunters and tourists have flocked to Selman Ranch to enjoy the pristine beauty and abundant wildlife. Selman Guest Ranch website advertises "One of the most amazing wildlife viewing and photographic opportunities in the Southern Great Plains of the Unites States of America" (Selman Guest Ranch 2020). Above all, the ranch is deemed a "bird watchers paradise," drawing visitors from across the country to witness the courtship rituals of the lesser prairie chicken (Selman guest Ranch 2020). However, Sue describes her rural lifestyles and conservation efforts as clashing with the push for more and more wind energy development in the area.

Grassland birds like the lesser prairie chicken (*Tympanuchus pallidicinctus*) are increasingly threatened species in North America because of prairie habitat destruction and fragmentation (Pruett, Patten, and Wolfe 2009a-b). The range of the lesser prairie chicken is restricted to the short mixed-grass lands and sand-sagebrush prairie of the southern Great Plains, a habitat greatly reduced compared to historic records (Figure 4 - habitat map; Horton et al. 2010). Reduced habitat and human activities have caused their numbers to decline sharply across this area, with population dropping by nearly 80 percent over the last 70 years (Hagen and Giesen 2005), leaving Selman Ranch one of the

few protected habitats left in the world. But now in a green-on-green contradiction between species conservation and renewable energy efforts, wind energy further threatens the prairie habitat.

Sue fears that wind energy developers and supporters are "willing to sacrifice" the entire species she has long fought to protect. She explained, "I have seen prime wildlife habitat destroyed by turbine and transmission line construction." As a result, Sue has noticed a steep decline in prairie chicken at her ranch with sitings growing more rare every year. A primary problem, she says, is that wind energy is growing too fast to truly understand its impact on the unique biota. Most studies of negative impacts of wind energy on birds focus primarily on collision with turbines blades and risk to migration (e.g., Desholm and Kahlert 2005; Krijgsveld et al. 2009; Loss, Will, and Marra 2013). Sue explains that non-migratory prairie chickens do not fit in these studies and the impact is more indirect and more difficult to study. Instead, she explains, they avoid vertical structures like wind turbines and transmission lines for miles because they perceive the towering features as a shelter for predatory species.

Some researchers agree that wind energy activities and structures further fragment the already limited habitat of prairie chicken, isolating populations and increasing risk of extinction (Pruett, Patten, and Wolfe 2009b). On the other hand, impacts of wind energy that researchers in Nebraska and Kansas found no spatial displacement of prairie-chickens near wind energy facilities (Harrison et al. 2017; McNew et al. 2014). However, a recent systematic review of the literature on the impacts of wind energy facilities on prairie grouse by Coppes et al. (2020) reported that fifteen out of 35 studies on the subject identified behavior response to wind turbines in grouse, including spatial

avoidance, displacement of mating and nesting sites, and time of breeding. Coppes et al. (2020) review found that wind turbine infrastructure effects grouse up to a distance of 500 meters, suggesting that "concerns about wind park construction within grouse habitats are highly justified" (p. 11).

Still, wind farm and transmission line development continues across the prairie chicken habitat. Still, some energy corporations seem dedicated stewardship toward wildlife by actively seeking solutions to help the negative impacts of energy extraction, generation, and transportation. For instance, OG&E Energy Corporation "has contributed $8.65 million to the Oklahoma Department of Wildlife Conservation to help offset the impacts of two wind-generation facilities in northwest Oklahoma" (Malone 2011). On the other hand, "Chermac Energy recently leased thousands of acres in prairie chicken habitat," Sue Selman said. Indeed, a Chermac Energy Google Site states that the company "has acquired over 90,000 acres of wind lease and easement rights in Harper, Dewey, and Texas counties" (Chermac Energy Corportation 2020). However, in March 2012, Chermac Energy also made contributions to the Voluntary Offset Program (VOP) to help compensate financially for a planned 55-mile long transmission line in the lesser prairie-chicken habitat (Van Pelt et al. 2013). During a meeting about quail and lesser prairie chicken conservation and a proposed transmission line project Sue said she "started crying when [she] saw the plans for the lines because they were just everywhere." In response, she rushed to the Corporation Commission with her concerns and successfully rallied to have the project moved farther south. Regardless of her best efforts, she worries transmission line companies will eventually use eminent domain to build directly through one of the last havens for prairie chickens in the Great Plains. As a

result, she has sought and continues to "raise awareness about the prairie, about its people, the loss of hunting areas, loss of wildlife habitat, and loss of livelihood." Sue explained that her mission has evolved into a mission to make outsiders understand the importance of the great western Oklahoma landscape and to teach them that this area is not simply an empty wasteland eager for any form of development.

As the prairie chicken faces the threat of becoming an endangered species, the debate over wind energy's impact on native species remains contentious. Sue proclaimed that her successful conservation efforts have in turn incited retaliation from wind energy supporters. During a 2010 House of Representative interim meeting, Representative Gus Blackwell promised that prairie chicken conservation efforts would not impede the spread of wind energy, citing the economic benefits as a primary concern. In an 2011 article, "Bird on a Wire," Gus Blackwell is quoted as saying "The economic impact of listing the Lesser Prairie Chicken would be devastating to the panhandle" and "to deny development of entire counties because of a single species is ludicrous" (Malone 2011). Sue explained that this proclamation quickly turned to a personal attack on her eco-tourism business and family's livelihood. Gus Blackwell wrote a bill (House Bill 2607) that would prohibit any person from "[exhibiting] endangered species in exchange for compensation." Sue said, "He might as well have put my name on that bill." The bill did not make any traction but represents just a fraction of the backlash Sue says that she has faced over her position. "It has been a major battle to save this area from wind farms so far," Sue claims, a battle "I will be fighting till the day I die."

CHAPTER 5: DISCUSSION AND CONCLUSION

The Department of Energy predicts wind energy to make up 20 percent of the electric energy mix by 2030 and 35 percent by 2050 (DOE 2015). If this projection becomes reality, the wind energy landscape will expand extensively in rural areas. Renewable energy transition literature, research, and advocacy focuses on forging pathways for low carbon energy. From this "How do we make it happen?" perspective, an important characteristic of wind energy discourse is identifying and overcoming sources of conflict and opposition to project development. Pro-wind campaigns to promote development and mitigate opposition, suggesting that wind energy development brings notable social and economic benefits to struggling rural communities with few supporting industries. Following this rural-benefits sales pitch, wind development has increased rapidly across west and northwest Oklahoma. The promise of economic betterment is particularly attractive to local governments in towns that have a history of boom-and-bust periods from the oil industry, such as Woodward.

Woodward embraced wind energy for its potential economic opportunity and became the state's first rural community to host commercial wind farm development 17 years ago. The overarching objective of this thesis has been to better understand the local-level impacts and perceptions of wind energy development in the rural, host community of Woodward, where oil and gas economics and culture long pre-date renewable energy. Specifically, I sought to investigate several factors influencing perceptions including (1) expectations of pre-wind farm economic and development promises, (2) pre-existing energy and rural culture, (3) post-installation experiences with

industry practices and policy. The case study also aimed to answer three key questions: (1) what are the perceived impacts of local wind energy development by host community members, (2) what are the social, economic, and environmental implications, and (3) how do the impacts compare with those of the oil and gas industry?

Stakeholder interviews, follow-up research, and field observations have provided a narrative of local experiences that disagree with rural benefit claims by wind energy developers, advocacy groups, and local authorities. The most notable aspect of the findings of this study is the overall negative attitudes toward and perceptions of the wind industry. While not every participant expressed completely negative views of wind energy, the overall tone was surprisingly negative for a community where local government has promoted wind energy as part of their economic development plan. Only one participant agreed with local government that "wind industry diversifies the economy and local industry" (Kyle Reynolds). Yet even he acknowledged that promises of benefits to local schools have been not been met, and other school districts face an uncertain financial future due to double depreciation tax schedules. All other participants generally shared a doubtful or negative view of the wind industry's positive impact in the area. Nearly all research participants viewed wind projects as non-beneficial to the economy, social aspects of the community, or the surrounding environment. This finding contrasts with several socioeconomic focused wind energy perception studies (i.e., Jacquet 2012; Mulvaney, Woodson, and Prokopy 2013; Slattery et al. 2012).

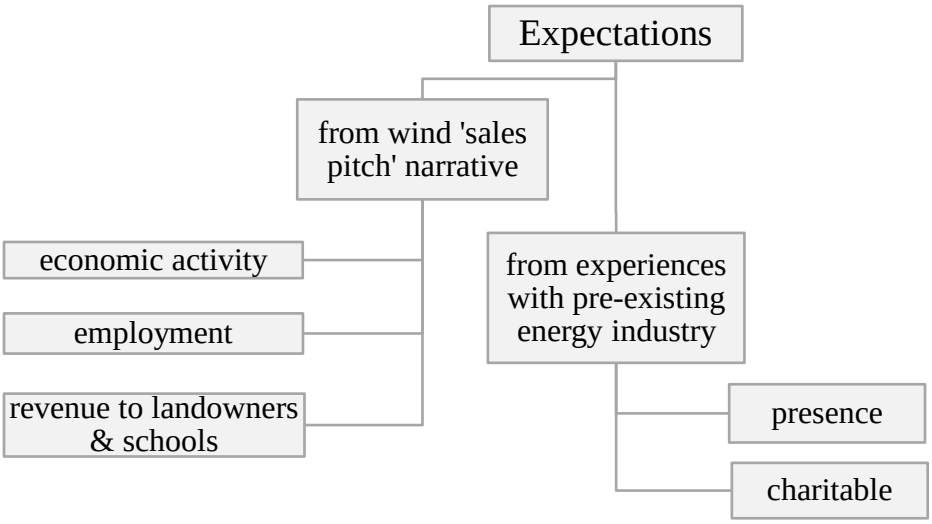
Interviewees also expressed knowledge of and concern for tax issues that leave some school districts unfunded by the wind industry while other communities and school districts benefit much more. Pre-existing energy systems, energy economies, and historic

context also shape benefits and community expectations. Participants illustrated the wind industry as lacking the physical and charitable presence they are familiar with from the oil and gas industry. And a local wildlife conservationist detailed a lengthy battle to protect native species and her rural lifestyle from large-scale development. Overall, results presented in this thesis show that positive economic and community development benefits promised by wind power projects are either not materializing as anticipated by subjects of this study, or successful economic returns are not being realized by all community members. The sentiments of participants I interviewed contrast with those of the city government. The following sections of this chapter discuss the extent to which the themes of this study address the main research questions, while relating the results to the existing body of knowledge on the topic. The chapter also reviews the limitations and implications of the research and offers suggestions for future research.

5.1 Expectations

Findings of this study show that expectations from place-based experiences prove to be key for a deeper understanding of public perceptions. Overall, negative perceptions of wind energy in for interviewees of this study were informed by two types of expectations: (1) expectations from a narrative created by wind advocated, developers, and local leaders to portray wind as a solution to rural economic struggles, and (2) expectations forged by long-held experiences with pre-existing oil and gas industry activities and culture (Figure 13). Each source of expectations has been found to play a unique role in post-development social perceptions of local wind energy and the wind industry as a whole.

Figure 13. Two types of place-based expectations from findings



5.1.1 Expectations from Wind Sales Pitch and Unrealized Economic Promises

Results presented in this thesis show that positive economic and community development benefits promised by wind power projects may not materialize as anticipated for interviewees in this study. Expected benefits included community spending and investment, local employment creation, and revenue for landowners and local schools through property taxes (e.g., Blue Canyon Wind Farm 2019; Competitive Power Ventures 2019; NextEra Energy Resources 2019). Although few micro-scale studies on wind farm communities exist (Table 3 in Chapter 2), it can be said that there is a dialectic in how wind companies sell the industry and its perceived benefits/impacts and the literature that gets published on the topic. For instance, in Woodward, interviewees depicted the economic benefits as exaggerated by the wind industry, short-

lived, and unable to provide any lasting relief from boom-bust economics. Interview participants explained that wind development only brought an economic boost to the area during the construction phase of projects. However, just like during oil and gas booms, the temporary flood of migrant workers left as quick as they came after construction was complete. Business owners I spoke to recounted no tangible long-term change to the ups and downs of the local energy economy 17 years post-wind farm construction. They also claimed that the job creation promise was exaggerated, revenue to landowners is not reinjected back into the community, and financial promises to public schools is completely non-existent. In fact, business owners I spoke to disagree with their mayor, John Meinder, who insisted wind energy stabilizes the local economy and that local citizens recognize the value of both the petroleum and wind industries. This difference could be because small business owners and local government officials measure economic impacts differently with government looking at macro-level economic indicators (i.e., GDP, employment figures, and population growth) and business owners looking at more micro-level indicators (i.e., repeat business and sales revenue). Another possibility is that revenues from wind projects are not being reinvested evenly across the community by the local government (Frantal 2015). On the other hand, perhaps economic benefits have indeed not materialized for the community of Woodward as promised, and government officials are less inclined to point out the community benefit shortcomings. It is also possible that early rural benefit narratives or other sources of information may have produced misunderstandings or unrealistic expectations of potential benefits among some community members, with perceived unmet promises resulting in negative perceptions of the wind industry post-development.

Overall, my findings support other studies that revealed minimal lasting economic incentives in wind power host communities (Munday, Bristow, and Cowell 2011; Bristow, Cowell, and Munday 2012). Through a similar multi-method, qualitative approach, Munday, Bristow, and Cowell (2011), for instance, found conventional economic benefit outcomes (i.e., income and jobs) from wind energy projects in rural Wales to be limited, undeterred by efforts of developers to improve community benefits through diverse forms of community ownership and benefit funds. The authors attribute the relatively dwarfed benefits to the supply side complexities that rely on imported goods and construction labor (Bristow, Cowell, and Munday 2012). They also found benefits streams to be relatively limited due to ad hoc administering of community benefit funds. Participants interviewed in Woodward perceived similar issues with transient labor, however, the source of goods and materials was not a topic discussed. Siemens Energy constructed a 64,000 square foot wind service distribution center in Woodward, as mentioned by School Superintendent, Kyle Reynolds. It is unclear how many jobs the facility has created for local residence, but a Woodward News article stated the facility was "expected to create up to 40 'green collar' jobs" (Ricks 2011). Siemens has been involved in providing components and parts for several wind projects in the area and across the state including OU Spirits wind project (formerly Keenan I) and Keenan II wind farm located south of Woodward, in 2010 (Siemens Energy 2012). However, the local Siemens center did not open in Woodward until February 2012 (Siemens Energy 2012), so it was not an initial source of local employment opportunity or goods for earlier projects. Now, the Siemens facility services nearly 600 wind turbines in Oklahoma (USWTDB 2020).

The lack of perceived economic benefits in Woodward, specifically, differ from the arguments made by May and Nilsen (2015) – that Great Plains areas reap greater potential benefits from wind power installation because of their rural condition including lack of industry and employment opportunities. May and Nilsen (2015) relate lack of benefits from wind developments with more industrialized locations in rural German areas. Indeed, several rural U.S. based case studies indicate that residents feel wind farms have generated economic benefits for their rural communities (Slattery et al. 2012). For instance, Slattery et al. (2012) found perceived socioeconomic factors to be key drivers of support for wind energy projects in Texas and Iowa communities. In fact, 69% of respondents that were very supportive of wind cited economic benefit including increased tax revenue, employment opportunities, and overall positive economic activity for the community and local schools. Mulvaney, Woodson, and Prokopy (2013) also found widespread support in three Indiana counties. The authors found respondents of the lower socio-economic status and rural Benton County to be supportive of wind for primarily economic reasons. A survey of Benton County residents revealed that 75% of respondents allowed turbines on their property because of the financial compensation. Reynolds (2012) also found perceived economic opportunity to yield more positive views of wind energy. Why the differences between my findings and these other U.S. case studies? As argued by Munday, Bristow, and Cowell (2011) the differences could be because the specific underlying economic needs of a locality are exceptionally difficult to measure prior to development, even when wind developers consult with the host community as residents and community leaders know their hometown issues. It is

possible that the largely generic economic benefit provisions of wind energy may not meet the wider economic needs of every host community.

This is not to imply that there are no local economic benefits from wind energy in Woodward. The participants actively mentioned short-term impacts. Longer-term benefits, however, are not apparent to the participants interviewed here. Collins, Hansen, and Hendryx (2012) suggest the full socioeconomic benefits of wind energy developments may not be fully realized for nearly a century, particularly when locals continue to compare the impacts to conventional oil and gas. Greene and Geisken (2013) further suggest that it is possible people "are not well informed about the revenue that is coming into the city from the development" (p. 6). Indeed, the local government in Woodward proclaim local wind projects have helped the economy.

Interestingly, the overall negative perception of wind energy by interviewees presented here also contradict the findings of Samms (2016). Samms conducted a qualitative study to explore perceptions of wind energy development in Woodward, Oklahoma. Using a snowball sampling technique, Samms interviewed community leaders such as government officials, business organization leaders, church leaders, and local farmers. Recall from the literature review that Samms found the people he interviewed to hold relatively neutral to positive views about wind energy in the area. Respondents largely noted the economic benefits of wind energy including lease payments to residents, economic activity from construction and maintenance, and "increased tax base for local school and municipal services" (Samms 2016, p. 33). In fact, Samms states that "[t]he contribution of tax dollars that went specifically to the direct funding of area schools was a common theme in the interviews" (p. 33). It is interesting that this thesis

finds evidence that contradicts Samms (2016). Samms further concluded that the wind industry did not conflict with the areas historic ties to the oil and gas industry. While perceptions of wind development in Samms' study were found to be "net positive for the area," some respondents did mention that financial benefits were less than they had anticipated but still a "much steadier form of income for the area in comparison [to oil and gas]" (p. 55). Overall, however, Samms found a relatively small number of respondents who expressed negative views toward or were opposed to wind energy development. The most probable reason for the differences between my results and Samms might be due to differences in sampling techniques and targeted participants. Clearly, the perceptions and experiences of local elites and leaders vary greatly from ordinary small business owners. This finding could indicate an issue of unequal distribution of benefits among community members. Hence, further qualitative research (i.e., interviews and surveys) of wind perceptions might include a range of stakeholders including groups excluded from the decision-making processes and industry recruitment. This finding also suggests that the initial study objectives and hypothesis, purpose of interview questions/wording, and characteristics of the interviewer may influence participant responses.

5.1.2 Place Identity and Expectations: Comparing Wind and Oil

In addition to the economic aspects of local wind energy development, the participants I interviewed perceive local benefits in terms of place identity (i.e., the local oil and gas culture). Regardless of the wind industry "sales pitch," or promises made by advocates, developers, and community leaders, my interviews showed that the

expectations of local business owners are strongly predicated on their experiences with pre-existing energy culture, economics, and industry activities. Business owner narratives illustrate that the oil and gas industry and its long-held presence in the community, significantly impact public expectations of positive benefits from the wind industry. Interviewees were quick to note both the similarities and differences between the wind industry and the traditional fossil fuel industry.

For instance, many participants claimed that not only does the wind energy not help stabilize the local economy, but it brought a boom and bust similar to those caused by the oil and gas industry. One participant even said "the wind is the same as oil" when explaining how his business is impacted by boom and busts of energy industries. On the other hand, differences between the two industries were also identified. In fact, business owners I spoke to in Woodward describe the industry as more of an unseen presence when it comes to being a part of the community.

In addition to boom-bust economics, oil boomtown literature largely agrees that the influx of the oil industry to rural communities brings in a wide range of negative social consequences, such as social disruption and breakdown of community values (England and Albrecht 1984; Lawrie, Tonts, Plummer 2011; Wilkinson et al. 1982). Even with the negative stigma of social disruption from the oil and gas industry, many of the participants I spoke with still longed for a similar presence with the wind industry and may be willing to overlook any negative social disruptions for the positive economic benefits they would bring.

Interviews with locals bring to light the 'presence in the community' difference between oil and gas and the wind power industry, with interviewees claiming that much

like the wind itself, they ‘do not see’ the wind energy companies as an active physical or charitable presence in the community. How do locals come to this realization? Business owners see it in their shops and their books – business is better when the turbines are being built, but once they are completed, economic activity returns to its earlier state. After construction is complete, they just don’t ‘see’ the wind industry like with the oil and gas industry. They do not ‘see’ the wind employees shopping in their stores, eating in their restaurants, staying in their lodgings, or living in their neighborhoods. They do not ‘see’ the wind industry making an effort to show support for the community through local investments or donations. Two participants commented that it was unfair to compare wind to the oil and gas industry. Still, they both made their own comparison of the two industries during our interviews. Clearly, previous place-based experiences with pre-existing oil and gas culture shape their expectations of other energy industries, regardless of the reality of those expectations.

Critiques of NIMBY theory have increasingly aimed to deepen the understanding of opposition by studying the link between place, place-attachment, place-identity, and negative emotional responses to renewable energy technologies (Devine-Wright, 2009; Fast and Mabee, 2015). Place-identity and place-attachment theory in wind perception literature often relates opposition to local wind projects with the visual impacts of development, place disruption, or threats to a greater symbolic value, cultural meaning, or social networks of a location (Bridge et al. 2013; Devine-Wright 2009; Devine-Wright and Howes 2010; Kempton et al. 2005). For instance, Devine-Wright and Howes’ (2010) comparative study of two host communities shows that negative perceptions of wind development can be related to the meaning of place, or place identity held by residents.

Negative responses specifically arose in one ‘tourist destination’ community where physical disruption to the environment was considered by inhabitants to threaten the natural ‘pristine’ landscape as well as their economy (Devine-Wright and Howes 2010). The other community, in economic decline, viewed wind development and change to the local landscape as an opportunity for economic betterment (Devine-Wright and Howes 2010). Jacquet and Stedman (2013) similarly found place-meaning and place-attachment to explain perceptions of environmental change from natural gas developments in Northern Pennsylvania. However, contrary to Devine-Wright and Howes (2010), “place meaning seemed to have little or no association with wind farm development” (p. 467).

The topic of expectations in wind perception literature tends to focus on industry and policy practices, economic opportunity, and environmental attitudes (Fergen and Jacquet 2016). The role of place-attachment and place-identity in shaping expectations, and hence, post-development experiences and perceptions, are an understudied feature of wind perception research. Expectations, specifically, constitutes a relatively limited part of wind perception literature (Fergen and Jacquet 2016). Among the few studies exploring the role of met or unmet expectations in shaping perceptions of wind, Frantal (2015) found unfulfilled or perceived low socioeconomic benefits to be a primary driver of negative attitudes in the Czech Republic. The author suggests that “acceptance of future development will be significantly affected by whether expectations of benefits from previous projects have been met, and whether perceived advantages of existing wind farms have outweighed their disadvantages” (p. 217). A South Dakota case study by Fergen and Jacquet (2016) found that unmet expectations do not always lend to negative perceptions of wind projects. These studies specifically explored the relationship between

met or unmet socioeconomic, environmental, or visual pre-construction expectations and post-development perceptions. The results of this thesis, on the other hand, suggest that the role of met or unmet expectations in shaping perceptions extends beyond the effects of persuasive communication, visual impacts, landscape change, or threats to place. While Samms (2016) found that wind energy did not appear to conflict with Woodward's historic ties to oil and gas, the comparative perception findings of this study indicate that not only does place-attachment and place-identity play a vital role in understanding public attitudes toward and perceptions of wind energy, but it is also a powerful factor shaping pre-development expectations, and hence, post-development perceptions of benefits. As an 'oil and gas community,' residents of Woodward expect a certain level of community 'presence' or involvement from any energy industry utilizing their local energy resources. But is this a realistic expectation of the wind industry?

5.2 Public Response as Residuals of Industry Motives

Other examples of community benefit shortcomings reported by respondents are that of tax avoidance schemes crafted by wind industry developers and tax abatement policies. A number of participants I interviewed were deeply concerned about how tax abatement and tax avoidance issues by the wind industry impact their community now and will continue to be an issue into the future. Interviewees were also concerned about the unevenness of wind energy benefits, pointing out that they believed other nearby communities, particularly school districts, are benefiting much more than the town of Woodward, regardless of having similar physical proximity to wind farms. In fact, multiple interviewees claimed that the wind industry outright "lied" about the funding

that would go to schools after wind farms were built. Only one interviewee, Superintendent Kyle Reynolds, still expressed support of the industry, while at the same time acknowledging that tax avoidance issues have left his school district receiving no funding from wind power. However, his continued support was primarily motivated by self-interest rather than prosocial regards — his hope being personal financial benefit as a landowner. The tax issues raised by interviewees raised questions about how promises to rural communities, specifically their schools, can be met under these business practices. Rural Oklahoma school systems rely heavily on increases in local property taxes to meet their growing needs. Indeed, triangulating these claims from participants with further research on the topic from news articles and interviews (i.e., Andy Evans and Kyle Reynolds) shows interviewees are correct to be concerned, and that this issue is not constrained to this area, raising a question about industry motives for building wind farms.

The issue of tax abatement was also found to be an issue driving social perceptions of wind energy in west Texas (Brannstrom, Jepson, and Persons 2011). Brannstrom, Jepson, and Persons (2011) used the term "Disenchanted About Tax Abatement" as the theme to discuss a group of individuals who were opposed to tax abatement given to wind-energy companies who have made what locals there perceive as "only slight contributions to the community apart from tax revenue" (p. 847). Complementary to results from Woodward, some respondents from Texas, with negative perceptions of wind energy, further broadened the 'Disenchanted' theme by claiming "wind-energy companies should donate directly to the community and that the wind employees should become more involved in local community events" (p. 847). Contrary

to my study, Brannstrom, Jepson, and Persons (2011) found other participants, called "Wind Welcomers," to be favorable toward tax abatement because they are viewed as "legitimate instruments to attract wind-energy development into economically marginalized areas" (p. 848).

My results, however, show perceptions of tax issues to be strong indicator of negative attitudes toward the wind industry. To be clear, most respondents were not opposed to wind energy, in general, or wind farms (with the exception being landowner Sue Selman). Instead, people take issue with post-construction wind industry behavior and perceived unfairness of the outcomes.

Thus, the findings of this study contribute to existing knowledge on the multi-dimensionality of perceptions toward wind energy, specifically regarding how attitudes can be informed by both types of perceived distributional fairness of wind power development (Cowell, Bristow, and Munday 2011; Gross 2007; Karmazina 2016; Rand and Hoen 2017). Distributional justice relates to the distribution of both the costs and benefits that a community might face from wind energy developments and is an increasingly common theme among wind energy perception literature (Karmazina 2016; Rand and Hoen 2017). First, individuals can raise concerns about how costs and benefits are distributed among different communities (Bell et al. 2013). Second, individuals may consider the benefits received as unfair compared to large profits made by energy companies, landowners, or other communities (Bell et al. 2013).

For instance, survey respondents in Michigan who supported local wind energy were found to be concerned about distributional fairness (Groth and Vogt 2014). They were troubled by perceived increased cost of energy being passed on to locals without

clarification and development not benefiting the local community while locally produced energy is being sent to other states (Groth and Vogt 2014). Respondents in Woodward expressed similar concerns for an imbalance between profits made by outsiders, compensations made to the local community, and the distribution of costs and benefits between Woodward and other nearby communities. They feel that a large portion of promised compensation intended to offset local costs (i.e., tax revenue for schools) have not been received, albeit wind companies continue to profit from the local environment. Gross (2007) similarly found that the perceived injustice of local resource exploitation by outsiders without proper compensation to locals incited opposition to wind projects. Walker and Baxter (2017) also found perceived unevenness of benefits from wind development to be the strongest predictor of local opposition or negative views.

Perceived fairness, or distributional justice, of expected benefits from wind development are inherently linked to levels of trust between elite decision-makers (i.e., wind energy developers, government officials, and sometimes landowners) and community members (Rand and Hoen 2017). Ultimately, trust depends on having expectations fulfilled and the perceived fairness of wind development (Aitken 2010; Fast and Mabee 2015). Results of this thesis show that perceived fairness and levels of trust can change over time based on experience and information. Rural benefit narratives proved successful for initially earning public trust and acceptance and moving proposed wind projects forward. Several participants expressed that people in the community were excited and supportive of local wind projects and the economic opportunities they promised during pre-development and construction phases. However, according to interviewees of this study, pro-wind agenda among wind developers and policymakers

can in turn diminish trust if the original motive was solely business oriented: “In order for this trust to be meaningful it cannot be conceived as a means to a particular end – i.e. less opposition and more wind farms” (Aitken 2010b, p. 1840). Indeed, the combined effects of sales pitch strategies, perceived questionable industry practices and tax issues, and perceived unmaterialized economic promises have left participants of this study resentful and untrusting of what they perceive to be absent benefits and deceitful industry practices. Those early relationships between developers and locals were largely based on a handshake deal. There were no policies or rules implemented by state or local government to guarantee these promised benefits were delivered. And post-construction mistrust driven by tax issues has damaged local relations amongst study participants and even spawned anti-wind power protagonists that did not previously exist. As a result, early wind energy campaigns, tax policies, abatement strategies, and tax avoidance issues have potentially threatened the community acceptance of future projects.

Still, the wind industry, its advocates, and policymakers are not the only sources of information driving the pro-wind-less-opposition agenda and rural benefits narrative. Academic literature, committed to securing the acceptance of wind power, have also fed into and informed perceptions of planning debates and the vocabulary of actors involved in the controversies and public discourse (Aitken 2010b). By using terms such as NIMBYism and branding opposers as deviant, ignorant, misinformed, and an obstacle to overcome, Aitken (2010b) asserts, researchers have failed to be critical of industry motives or “acknowledge that objectors might have legitimate and valid concerns” (p. 1838). As such, this “highlights the importance of ensuring that the academic literature

reflects on its own assumptions and interests as these can feed into policy and practice" (Aitken 2010b, p. 1836).

From the findings of this study, I contend that it is also necessary to better understand how aspects that may be hidden from academic literature because of the renewable energy agenda are experienced by the public. For instance, the shortcomings of the renewable energy industry, as well as the economic similarities between wind energy and the oil and gas industry, is largely missing from wind energy perception discourse. Further, it should not be assumed that wind developers and industry leaders hold similar values to environmental or climate motivated researchers. This insight suggests more research focus should also be placed on understanding the more business-centric goals of wind energy developers as well as the consequences of benefit narratives and non-altruistic energy industry motives, specific industry marketing strategies and financially driven schemes.

Furthermore, the issues of perceived fairness and trust highlighted in this thesis raise questions about wind energy in the context of sustainable development efforts. Wind energy is a significant part of global efforts towards a more sustainable future, where sustainable development is development "that meets the needs of the present generations without compromising the ability of future generations to meet their own needs" (Ball et al. 2017; Mroczek, Kurpas, and Klera 2013, p. 113). With regards to energy, sustainable design consists of an optimal balance between economic growth, social equality, and environmental protection (Bell et al. 2017). Despite its many benefits, "the sustainability of wind energy can be improved" (Ball et al. 2017, p. 2). And the host community perceptions and social equity of wind energy should be considered in the

social dimension of sustainability along with environmental and economic issues (Botelho et al. 2016; Mroczek, Kurpas, and Klera 2013). According to Mroczek, Kurpas, and Klera (2013), the perceptions of host communities cannot be underestimated in expanding our knowledge of the social (and spatial) equity issues of wind power development. Results of this thesis show that perceived fairness and levels of trust can change over time based on experience and access to information, disrupting the equilibrium between the three pillars of sustainable development. However, when assessing the sustainability of renewable energy projects, the experiences of residents in host communities and their welfare losses (perceived or otherwise) are often neglected (Botelho et al. 2016). As expressed by Botelho et al. (2016), "public decision-makers [could] gain from better understanding of this equity asymmetry problem" by assessing social impacts and perceptions of damages and benefits after the planning and construction phases of a project (p. 436).

5.3 Green-on-Green Collision and Prairie Lifestyle

Finally, this study identified another conflict taking place in rural Oklahoma prairies where the wildlife conservation efforts and prairie lifestyle of one participant collides with wind power infrastructure. Sue Selman suggests that wind energy is not only being built upon a pre-existing energy landscape, but the physical location of wind energy structures also means controversial changes in the rural, prairie culture and its unique ecological environment. First, green-on-green contradiction represent two dichotomous discourses about the value and use of rural landscapes, each with environmental protection agendas and narratives. The debate is driven by a spatial

overlap between the interests of local wildlife conservationists and prime siting locations for wind farm development, pinning environmentalists against environmentalists (Neri et al. 2019). In Northwest Oklahoma, the current and projected location of wind farm projects overlap one of the few remaining habitats of an already threatened species, the Lesser Prairie-Chicken.

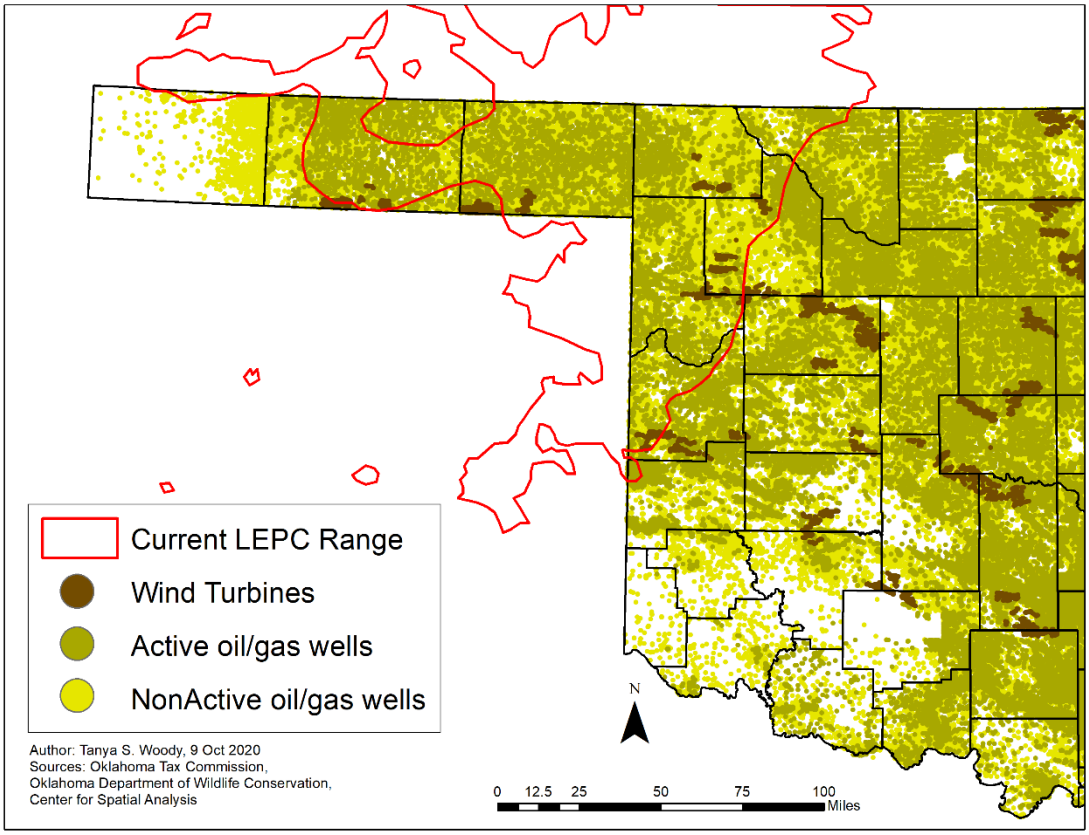
This issue has been of increasing interest among wind energy impact literature (i.e., Pruett, Patten, Wolfe 2009a; Pruett, Patten, Wolfe 2009b; McNew et al. 2014; Winder et al. 2014). It is important to note, however, that wind energy is not the only potential threat to the species. Other anthropogenic disturbances, such as climate change, early homesteading, oil and gas activities, roads and fences, power lines, agricultural activities (i.e., native grassland conversions to cropland and even livestock overgrazing) have all resulted in prairie habitat loss and fragmentation (Greenwald 2019; Hovick et al. 2017). Wind energy is just the most recent potential threat in a long history of prairie habitat fragmentation and loss.

In fact, lesser prairie-chicken populations were in sharp decline long before wind energy development moved into the area (Wolfe, Larsson, and Patten 2016), and their habitats have a long history of intensive oil and gas development (Figure 14). Still, research on how energy infrastructure impacts prairie-chicken has primarily focused on wind energy (Winder et al. 2014). “At present, there are relatively few studies investigating prairie-chicken response to other types of energy development such as oil and gas” (Hovick et al. 2017 *in* Londe et al. 2019, p. 3). In one of those few studies, Londe et al. (2019) recently found that high density of oil and gas infrastructure in the

Flint Hills Ecoregion of Oklahoma also negatively impacts prairie-chickens through home range displacement during various seasons.

So why is it that wind energy development seems to bear the brunt of the scrutiny by both the public, researchers, and conservationists? Hirsh and Sovacool (2013) suggests that it is the reason may be psychologically and symbolically driven. The authors claim it is the visually obvious nature of tall, spinning silhouettes that stirs such strong opposition and animosity, because it shifts our long and successful history of energy consumption into plain view, no longer hidden from society – an "uncomfortable" reminder to observers of what our energy footprint necessitates (Hirsh and Sovacool 2013). While prairie-chickens are considered an umbrella species of the American prairie, wind-energy has similarly become an umbrella technology, "reminding us that all electricity-generation technologies engender environmental consequences" (Hirsh and Sovacool 2013, p. 709). Hirsh and Sovacool (2013) further attribute wind energy opposition with an inner struggle between the social and economic values of modern, urban life and rural existence.

Figure 14. Current Lesser Prairie-Chicken Range and Energy Extraction Activity in Northwest Oklahoma



Sue's second motivation for opposition to development supports this theory. Her ranch is not only a prairie-chicken habitat but is also a rural way of life going back generations. Her position on wind energy in rural northwest Oklahoma illustrates conflict between the narrative produced by different wind energy stakeholders and the histories of some rural landowners. For Sue, the rural landscape she calls home is not an empty place to be developed, but a place full of memories and breathing with life. In Oklahoma, the wide-open space and grassland prairie are well known as a defining characteristic of the state, in general, and as an element of place attachment, more specifically, for rural locals. Sue feels that different empowered stakeholders misrepresent the landscape as

void of culture and people or ‘in need of economic stimulus’ in their effort to control land use and development. This rhetoric used to implement wind development in the prairie brings to mind a contemporary manifest destiny, a new attempt to redefine the landscape as less valuable in its current state in order to justify the expansion of renewable energy development.

In response, Sue’s history with the land and emotional attachment to place (Devine-Wright 2009) translates “into a territorial imperative to protect [her] place against wind farms” (Fast and Mabee 2015, p. 32). From the perspective of Bell et al. (2013), Sue’s story does not represent evidence of NIMBYism but is instead a “place-protector” (p. 123). She opposes local wind development “because of the value that she sees in that particular place while not seeing the same value or remaining agnostic on the value of other places where developments might take place” (Bell et al. 2013, p. 123). She is not impressed by financial incentives offered by developers, because she cannot put a monetary value on the experiences and ties she has with the land (Bell et al. 2013).

Brehm et al. (2006) similarly found cultural identity and natural environment attachment corresponded with strong protective behavior for rural counties west of the Rocky Mountains. Their study also related such attitudes to the historic, cultural identity of rural settings, specifically “lands with histories deeply rooted within family traditions of ranching, farming, hunting, fishing, and related activities” (p. 160). Conversely, Jacquet and Stedman (2013) found that place attachment has little impact on resident attitudes toward energy development among select counties of the Armenia Mountain region. Bishop (2011) claimed a solution is that “[wind] farms should not be located on highly valued landscapes” and “protected sites should be avoided” (p. 4165). This

simplistic solution to the wind energy controversy, however, does not account for the subjective nature of valued landscape or corporate advertising as objectification of specific landscapes. Thus, framing the rural landscape in purely economic and untapped terms neglects its pre-existing cultural identity and ecological values held by rural landowners, further proving geographer Bret Wallach's (2015) point that "[all landscapes have] been built to make money."

5.4 Missing Themes

Interestingly, several key themes from the literature related to impacts and perceptions of wind energy were missing from my findings. First, a prominent focus of previous perception literature places aesthetics and visual impacts as a primary environmental impact of wind energy and a key reason for objections to wind farms (Fast and Mabee 2015; Molnarova et al. 2012; Sullivan et al. 2012; Warren et al. 2005). However, Devine-Wright (2005) has argued that "despite the predominant emphasis upon negative visual impacts of turbines in the literature, there is little evidence that wind turbines are universally perceived as ugly" (p. 128). My findings cannot corroborate or debate this statement as visual impacts were a topic that was interestingly absent from the results. A potential reason for this could be that participants of this study are largely affected by the visual impacts of wind energy in the area. Turbines around Woodward are only visible when traveling to the more rural areas northeast and southwest of the town.

Similar to the study in Nolan County, Texas by Brannstrom, Jepson, and Persons (2011), themes of this study suggest that local place-based experiences during local wind project development largely informed perceptions rather than concerns about aesthetics,

moral values, or environmental concerns (Table 3 in Chapter 2). Only one participant that I interviewed, landowner Sue Selman, briefly mentioned visual and noise impacts in our interview. She described them as "unsightly" and "noisy." Still, the primary reason for her negative views toward wind development was its threat to local wildlife and her rural lifestyle, not physical characteristics. The other participants I interviewed made no mention whatsoever of being able to see or hear turbines, living anywhere near turbines, or viewing turbines as unattractive or out of place in the landscape (Lothian 2008; Molnarova et al 2012). Negative reactions toward wind energy had nothing to do with turbine characteristics (i.e., size, color, scale) and disruption of scenic view and more to do with concerns about industry motives perceived as deceptive and the local economy, thus refuting the physical proximity hypothesis for explaining perceptions (Swofford and Slattery 2010; Van der Horst 2007). Specifically, negative public perceptions of wind energy in Woodward are informed by issues such as perceptions of tax policy, economics, wildlife, and doubts about the distribution of benefits.

People interviewed in Woodward also did not seem interested in the climate/environmental benefits of renewable energy. In fact, the clean, renewable, or sustainable aspects of wind energy were not discussed or mentioned by any of the participants I interviewed. Even the few individuals who had something positive to say about local wind energy did not mention environmental benefits. A potential reason for this is that Woodward Oklahoma was called "one of the most climate-skeptical counties in the U.S." in a CNN opinion piece (Sutter 2015). This finding also runs contrary to Samms (2016) who found community leaders and government officials to be full of pride at being a center for 'clean energy' (p. 55). Slattery et al. (2012) argue this finding

indicates that “arguing for more renewable sources of energy based on reducing our carbon footprint (and, by extension, mitigating against climate change)” may not be a successful persuasive method for such communities (Slattery et al. 2012). On the other hand, it could mean that, by focusing primarily on potential economic benefits, persuasive measures by advocated and developers have failed to educate the public on the actual local and global environmental benefits. It further suggests that being at the epicenter of wind energy development does not mean energy use views and practices will somehow be drastically changed (Jepson, Brannstrom, and Persons 2012).

Furthermore, the perceptions expressed by participants of this study do not support the U-Curve theory of changing support for renewable energy technology (Krohn and Damborg 1999; Devine-Wright 2005; Wolsink 2007). The U-Curve theory of support suggests that opposition to local development is low before construction, highest during the siting and construction phase, and then low again post-development as the community grows accepting of the change.

It has been 17 years since the first wind turbine was constructed in the rural plains outside Woodward, Oklahoma. Nevertheless, negative attitudes toward local wind projects persist nearly two decades post-construction. Results also indicate that for these interviewees the relationships between community members and the industry are constantly evolving, and pre-development support does stipulate post-development support. Groth and Vogt (2014) similarly found negative attitudes toward local wind energy nearly half a decade post-construction, citing uncertainty and unclarity about the industry, increased electric rates without explanation, and noise complaints as the reason. Thus, the assumption that greater familiarity with wind energy development will lead to

more positive views is not always supported (Devine-Wright 2005; Rand and Hoen 2017). Results of this study indicate the opposite – greater familiarity with the wind industry can incite negative perceptions post-development.

5.5 Limitations

In addition to time, weather, and monetary constraints limiting access to participant recruitment, there are several limitations inherent in the qualitative methodology of this study. First, there is extensive literature on the social, economic, and environmental impacts and perceptions of wind energy. However, the research placing wind energy impacts and perceptions in context of pre-existing oil and gas is surprisingly limited given the similar geographic distributions. While this study helps fill the gap, limited literature on the topic makes it difficult to use existing research to help frame this study or to compare and contrast these findings with other closely related research and draw meaningful conclusions from them.

Second, this study is limited by its sample size, single-case study design, and the potential bias. Time, money, and weather constraints and challenges resulted in a smaller than anticipated sample size. The limited number of participants does not permit statistical validation of the results. Further, the limited sample size of primarily small business owners may not be representative of the entire community, and it cannot be said that all other business owners in Woodward hold similar sentiments. This study is also limited to a single town case study, thus making it difficult to draw generalizations from the findings. Thus, results from this single case study may not be applicable to other communities in Oklahoma or other states.

Also, while I attempted to maintain a random sampling technique to recruit participants to this study, Sue Selman was obtained from a snowball or referral technique, introducing potential bias to the overall results (Atkinson 2001). It is likely that Sue's narrative is biased toward the views of Mr. Hill, and therefore "will over-emphasize cohesiveness in social networks" (Atkinson 2001, p. 4). Moreover, Sue's narrative cannot be said to represent the opinion of other landowners or ranchers in the area. Together Sue's responses and business owner responses may be biased towards a more cooperative group of participants who agreed to interviews (Heckathorn 1997). For example, cooperative participants are likely to hold similar views and "minorities often have the louder voices" (Krohn and Damborg 1999, p. 5). Thus, views captured by the sample may omit contrasting experiences and perspectives among the population.

Based on the above limitations, if I had more time and money, this research would have benefited from a larger sample sizes spread among multiple Northwest Oklahoma communities including more landowners, those with and without wind turbines on their land. This study also could have benefited from additional interviews with wind energy company representatives and state government officials, specifically those involved with ad valorem taxes. Additionally, if conducting this research again, I would plan to conduct interviews during warmer months to limit the possibility if weather prevented travel.

Furthermore, aside from sample size and single case-study limitations, several forms of bias can be introduced during the interview process itself and during analysis. For one, I cannot be sure of the honesty and recollection of respondents, or account for the correctness of any statements, claims, or specific positions made by interview participants. However, providing the option for anonymity and triangulating claims with

other sources of information increase the credibility of findings. Still, bias can be introduced into a qualitative study through cultural and value differences between the researcher and respondents during interviews (Qu and Dumay 2011). As explained by Qu and Dumay (2011), "[e]ven when the interviewer and the interviewee seem to be speaking the same language, their words may have completely different cultural meanings" (p. 239). Thus, both the interviewee and the interviewer can be a potential source of bias should questions or answers be misunderstood by the other. In fact, when using a semi-structured interview guide, "[d]ifferent interviewers will evoke different responses from the same interviewee given the way questions are asked and probed" (Qu and Dumay 2011, p. 247). Further, as Turner and Martin (1984) stated:

> [T]he social characteristics of an interviewer and a respondent, such as age, race, and sex are significant during their brief encounter; different pairings have different meanings and evoke different cultural norms and stereotypes that influence the opinions and feelings expressed by respondents (p. 271).

Additionally, my 'outsider' status by virtue of cultural, geographic, and educational difference has the potential to impact research outcomes (Kerstetter 2012). For instance, research participants may be less willing to speak full truths to a person considered an 'outsider' (Holloway and Biley 2011). On the other hand, participants may be fully forthright, but their voices can be distorted by the researcher (Holloway and Biley 2011). During the process of listening and selecting which narratives and observations to include in the results and which to omit the researcher takes control of those voices. As a result of interpretation and levels of abstraction "some of the meaning that participants give to their experience may be lost" (Holloway and Biley 2011, p. 972).

While I made best efforts to present the views of participants and not my own, it is also possible that my own experiences, ideas, prejudices, and personal world views, or my personal *lens*, skewed the data collection process and analysis of results (Fusch, Fusch, and Ness 2018; Smith and Noble 2014). However, the use of methodological triangulation in this study can "assist in mitigating any researcher bias" and contributes to more reliability of results (Fusch, Fusch, and Ness 2018, p. 21).

5.6 Conclusion

Since I started this research, Oklahoma has added seven new wind farms and 140 new turbines to its energy landscape in northwest Oklahoma (USWTDB 2020). These towering turbines sprouting from the prairies have been, and continue to be, marketed as symbols of economic hope for struggling rural Oklahoma communities, "generating jobs, incomes, and opportunities" (Haggie 2020, no page number). A recent 2020 National Geographic article states "Wind power is breathing new life into Oklahoma's energy industry, bringing green dollars and jobs to a state built on oil and gas" (Heggie 2020, no page number). The article further states that the "sparsely populated" and "relatively unproductive" "western Oklahoma was in need of an economic boost, and wind power has brought exactly that" (Heggie 2020). Themes embedded in this study, however, illustrate a striking divide between such rural benefit narratives and interviewee experiences and perceptions.

Results of this case study illustrate the complex and multidimensional nature of wind energy development interests, expectations, and perceptions by various stakeholders. Both pro-wind motives of various decisionmakers and local expectations

and perceptions are shaped by different interests and worldviews. The City of Woodward government accepted wind energy to the area as a means to ameliorate the economic struggles of being a rural, oil and gas town. However, participants of this study suggest that positive economic benefits promised by wind power projects have not materialized as anticipated. Interviews show that expectations and perceptions of wind energy benefits are informed by previous place-based experiences and familiarity with wind energy industry practices. For some business owners in Woodward, wind energy is welcome, but their expectations and perceptions of the outcomes are predicated on place-based experiences with the oil and gas industry. As such, they recognize the similarities between energy industries, and they expect to 'see' that industry as an active, supporting part of the community by being a physical and charitable 'presence.' For one landowner and conservationist, the very existence of wind energy infrastructure is viewed as a threat to local wildlife and her rural lifestyle. And for Andy Evans of the Oklahoma Public School Resource Center, his primary concern is the financial health and future of Oklahoma schools, particularly in impoverished rural areas. He has 'no problem' with wind power in Oklahoma, as long as they pay their taxes and support rural education as promised.

The decisions to welcome wind power by state and local government have largely been driven by economic interests. But those local economic interests clash with the profit-maximizing intentions of corporations, proving that even the best of intentions can backfire. It was state funded subsidies in the form of tax abatements designed to bring a more prosperous future to Oklahoma that pioneered wind energy in the state. Results of this study suggest that the generosity of the state policies and welcoming demeanor of

rural communities may have also attracted deceptive corporate practices, such as tax avoidance schemes. Further, there is a flaw in the intentions of government who planned for tax abatement strategies to benefit all schools with wind farms in their boundaries.

Former Governor Frank Keating now condemns the decision to subsidize wind, seeking a reversal of previous pro-wind policies. Similar to the narrative of Andy Evans, Gov. Keating proclaims the choice of policy instruments focusing on luring this new industry may have put the state in a financially uncertain future. Regretful government policy, however, is difficult to reverse. The state now has billions of tax-payer dollars invested in the industry, and efforts to change the policies and deploy new programs to seek synergy between wind energy and state budget concerns are met with strong opposition, as energy companies threaten to simply take their business elsewhere (see Handy 2018). Plus, the push to end state funded subsidies do not address the overestimated or undelivered promises to host communities and the persisting local costs. In Woodward, landscapes are now surrounded by what some perceive as broken promises. But what can be done to remedy the situation?

The narratives identified in this thesis suggest that state and local policies should seek to renegotiate terms of wind energy investment while holding companies involved in development more accountable for the social, economic, and environmental impacts of their projects. Additionally, there is clearly a need for a more constructive and realistic understanding and dialogue about the benefits of wind energy for host communities. According to the interviewees of this study, the existing narrative of benefits to rural communities tends to be vague, over-generalized, and sometimes completely inaccurate. Further, relationship and trust-building efforts on behalf of wind energy companies

should extend beyond discussions with community leaders and should not end just because construction is complete. Assessment of post-development experiences and perceptions of host communities should become part of energy industry business models to build more symbiotic relationship between renewable energy efforts and wind-rich Great Plains communities. Finally, wind companies and government officials should seek to create more equitable and discernible distribution of benefits.

Further, for too long, acceptance and the successful expansion of renewable energy been the primary goal of understanding negative perceptions to projects, rather than understanding the complexities of fair and just outcomes. Additionally, continuing to view negative views to wind energy as something to overcome "prevents meaningful understanding and implementation of best practices" (Rand and Hoen 2017, p. 19). Instead, future researchers should consider communities exposed to long-established wind power projects as highly knowledgeable about local experiences with development and related industry practices. Then, they might be able to provide insight into how local costs and impacts should play out on balance with benefits. Conflicts over perceived expectations and impacts should be respected and valued for their ability to reveal the complex dimensions of community experience, social identity, and exposed to industry practices. Also, themes uncovered in this study suggest that investigating perceptions and impacts of wind energy in the context of pre-existing energy culture have much to offer researchers. Results presented here also agree that "[f]uture research should be attentive to the unequal distribution of benefits from wind-power development and to the debates surrounding the incentives that elites offer to wind-energy firms" (Brannstrom, Jepson, and Persons 2011, p. 850). The findings of this study additionally lend support to the

concept that the complex relationship between host communities and the energy industry requires focus to shift away from simple ‘acceptance’ and “securing public buy in” towards a deeper, longer-term responsive understanding of the varying levels of community needs and priorities (Ellis and Ferraro 2016).

REFERENCES

Aitken, Mhairi. "Wind power and community benefits: Challenges and opportunities." *Energy policy* 38, no. 10 (2010): 6066-6075.

Aitken, Mhairi. "Why we still don't understand the social aspects of wind power: A critique of key assumptions within the literature." *Energy policy* 38, no. 4 (2010b): 1834-1841.

Altman, Irwin, and Setha M. Low, eds. *Place attachment*. Vol. 12. Springer Science & Business Media, 2012.

American Wind Energy Association (AWEA). "State Fact Sheets – Wind Energy in Oklahoma." Updated October 2019. https://www.awea.org/Awea/media/Resources/StateFactSheets/Oklahoma.pdf.

American Wind Energy Association (AWEA). "Environmental Benefits." https://www.awea.org/wind-101/benefits-of-wind/environmental-benefits (Accessed February 2020).

Anawar, Hossain M., and Vladimir Strezov. "Current Status of Renewable Energy Systems from Biomass: Global Uses, Acceptance, and Sustainability." In *Renewable Energy Systems from Biomass*, pp. 1-13. CRC Press, 2018.

Aslani, Alireza, and Kau-Fui V. Wong. "Analysis of renewable energy development to power generation in the United States." *Renewable Energy* 63 (2014): 153-161.

Atkinson, Rowland, and John Flint. "Accessing hidden and hard-to-reach populations: Snowball research strategies." *Social research update* 33, no. 1 (2001): 1-4.

Bagheri, Mehdi, Seyed Hamid Delbari, Mina Pakzadmanesh, and Christopher A. Kennedy. "City-integrated renewable energy design for low-carbon and climate-resilient communities." *Applied energy* 239 (2019): 1212-1225.

Bakker, Roel H., Eja Pedersen, Godefridus Petrus van den Berg, Roy E. Stewart, W. Lok, and J. Bouma. "Impact of wind turbine sound on annoyance, self-reported sleep disturbance and psychological distress." *Science of the Total Environment* 425 (2012): 42-51.

Ball, Zachary, Joe Szabo, Felipe M. Pasquali, and John F. Hall. "A Framework for Wind Energy Conversion to Promote Sustainability in Product Design." In *International Design Engineering Technical Conferences and Computers and Information in Engineering Conference*, vol. 58219, p. V007T06A040. American Society of

Mechanical Engineers, 2017.

Batel, Susana, Patrick Devine-Wright, and Torvald Tangeland. "Social acceptance of low carbon energy and associated infrastructures: A critical discussion." *Energy Policy* 58 (2013): 1-5.

Baxter, Pamela, and Susan Jack. "Qualitative case study methodology: Study design and implementation for novice researchers." *The qualitative report* 13, no. 4 (2008): 544-559.

Bell, Derek, Tim Gray, Claire Haggett, and Joanne Swaffield. "Re-visiting the 'social gap': public opinion and relations of power in the local politics of wind energy." *Environmental Politics* 22, no. 1 (2013): 115-135.

Betakova, Vendula, Jiri Vojar, and Petr Sklenicka. "Wind turbines location: How many and how far?" *Applied Energy* 151 (2015): 23-31.

Bidwell, David. "The role of values in public beliefs and attitudes towards commercial wind energy." *Energy Policy* 58 (2013): 189-199.

Bishop, Ian D. "What do we really know? A meta-analysis of studies into public responses to wind energy." In *World Renewable Energy Congress-Sweden; 8-13 May; 2011; Linköping; Sweden*, no. 057, pp. 4161-4168. Linköping University Electronic Press, 2011.

Black, Brian, and Marcy Ladson. "The Legacy of Extraction: Reading Patterns and Ethics in Pennsylvania's Landscape of Energy." *Pennsylvania History* 79, no. 4 (2012): 377-394.

Blatt, David. "Cost of oil and gas tax breaks continues to approach $400 million." December 21, 2017. Okpolicy.org. https://okpolicy.org/cost-oil-gas-tax-breaks-continues-approach-400-million/.

Blue Canyon Wind Farm. "Oklahoma | Blue Canyon Wind Farm." Accessed 29 Jul. 2019. https://bluecanyonwindfarm.com.

Bluestone, Barry. "What makes working cities work? Key factors in urban economic growth." *Community Development Issue Brief* 3 (2014): 1-21.

Botelho, Anabela, Lígia MC Pinto, Lina Lourenço-Gomes, Marieta Valente, and Sara Sousa. "Social sustainability of renewable energy sources in electricity production: An application of the contingent valuation method." *Sustainable Cities and Society* 26 (2016): 429-437.

Boyd, Dan T. "Oklahoma oil and gas production: Its components and long-term outlook." *Oklahoma Geology Notes* 65, no. 1 (2005): 4-23.

Boyd, Dan T. "Oklahoma's oil and gas industry and the global forces controlling it." (2006): 145-154.

Brannstrom, Christian, Wendy Jepson, and Nicole Persons. "Social perspectives on wind-power development in West Texas." *Annals of the Association of American Geographers* 101, no. 4 (2011): 839-851.

Braun, Virginia, and Victoria Clarke. "Thematic analysis." *APA Handbook of Research Methods in Psychology* 2 (2012).

Brehm, Joan M., Brian W. Eisenhauer, and Richard S. Krannich. "Community attachments as predictors of local environmental concern: The case for multiple dimensions of attachment." *American behavioral scientist* 50, no. 2 (2006): 142-165.

Bridge, Gavin, Stefan Bouzarovski, Michael Bradshaw, and Nick Eyre. "Geographies of energy transition: Space, place and the low-carbon economy." *Energy policy* 53 (2013): 331-340.

Bristow, Gillian, Richard Cowell, and Max Munday. "Windfalls for whom? The evolving notion of 'community' in community benefit provisions from wind farms." *Geoforum* 43, no. 6 (2012): 1108-1120.

Brown, Jason P., John Pender, Ryan Wiser, Eric Lantz, and Ben Hoen. "Ex post analysis of economic impacts from wind power development in US counties." *Energy Economics* 34, no. 6 (2012): 1743-1754.

Brown, Jason P. "The Response of Employment to Changes in Oil and Gas Exploration and Drilling." *Economic Review* 100, no. 2 (2015): 57-81.

Bulkeley, Harriet. *Cities and climate change*. Routledge, 2013.

Burningham, Kate, Julie Barnett, and Diana Thrush. "The limitations of the NIMBY concept for understanding public engagement with renewable energy technologies: a literature review." (2006).

Burningham, Kate, Julie Barnett, and Gordon Walker. "An array of deficits: unpacking NIMBY discourses in wind energy developers' conceptualizations of their local opponents." *Society & Natural Resources* 28, no. 3 (2015): 246-260.

Castleberry, Becca, and John Scott Greene. "Impacts of wind power development on Oklahoma's public schools." *Energy, Sustainability and Society* 7, no. 1 (2017): 34.

Castleberry, Becca, and John Scott Greene. "Wind power and real estate prices in Oklahoma." *International Journal of Housing Markets and Analysis* 11, no. 5 (2018): 808-827.

Census Bureau. "U.S. Census Bureau QuickFacts: Woodward city, Oklahoma; Woodward County, Oklahoma." 2019. Census.gov. Accessed 16 Mar. 2019. https://www.census.gov/quickfacts/fact/table/woodwardcityoklahoma,woodwardcountyoklahoma/PST045218.

Chandy, Smrithi K. "Tapping Renewable Energy Sources in Contemporary India; Issues and Challenges." *Invertis Journal of Renewable Energy* 10, no. 1 (2020): 1-6.

Chermac Energy Corporation. "Wind Energy." Accessed Nov. 28 2020. https://sites.google.com/site/charmacenergy/wind.

City of Woodward. "Woodward Economic Development." 2019. Accessed 15 Mar 2019. http://cityofwoodward.com/204/Woodward-Economic-Development.

Collins, Alan R., Evan Hansen, and Michael Hendryx. "Wind versus coal: Comparing the local economic impacts of energy resource development in Appalachia." *Energy policy* 50 (2012): 551-561.

Competitive Power Ventures. "CPV: Community Benefits". Accessed 29 Jul. 2019. http://cpv.com/our-projects/cpv-keenan/community-benefits/.

Coppes, Joy, Veronika Braunisch, Kurt Bollmann, Ilse Storch, Pierre Mollet, Veronika Grünschachner-Berger, Julia Taubmann, Rudi Suchant, and Ursula Nopp-Mayr. "The impact of wind energy facilities on grouse: a systematic review." *Journal of Ornithology* (2020): 1-15.

Creswell, John W., and Cheryl N. Poth. *Qualitative inquiry and research design: Choosing among five approaches*. Sage publications, 2016.

Dai, Kaoshan, Anthony Bergot, Chao Liang, Wei-Ning Xiang, and Zhenhua Huang. "Environmental issues associated with wind energy–A review." *Renewable Energy* 75 (2015): 911-921.

Database for State Incentives for Renewables & Efficiency (DSIRE). "Zero-Emission Facilities Production Tax Credit." Last updated June 10, 2019. https://programs.dsireusa.org/system/program/detail/624 (December 28, 2019).

De Boer, Jessica, Christian Zuidema, and Katharina Gugerell. "New interaction paths in the energy landscape: the role of local energy initiatives." *Landscape Research* 43, no. 4 (2018): 489-502.

Deign, Jason. 'Wind Forecast: Doubling Global Capacity by 2027 Will Be a Breeze." April 9, 2018. https://www.greentechmedia.com/articles/read/wind-forecast-doubling-capacity-by-2027-will-be-a-breeze.

Del Rio, Pablo, and Mercedes Burguillo. "An empirical analysis of the impact of renewable energy deployment on local sustainability." *Renewable and Sustainable Energy Reviews* 13, no. 6-7 (2009): 1314-1325.

Denholm, Paul, Maureen Hand, Maddalena Jackson, and Sean Ong. "Land-Use Requirements of Modern Wind Power Plants in the United States." NREL Technical Report TP-6A2-45834. 2009. https://www.nrel.gov/docs/fy09osti/45834.pdf.

Denzin, Norman. "Strategies of multiple triangulation." *The research act in sociology: A theoretical introduction to sociological method* 297, no. 1970 (1970): 313.

Desholm, Mark, and Johnny Kahlert. "Avian collision risk at an offshore wind farm." *Biology letters* 1, no. 3 (2005): 296-298.

Devezas, Tessaleno, David LePoire, João CO Matias, and Abílio MP Silva. "Energy scenarios: Toward a new energy paradigm." *Futures* 40, no. 1 (2008): 1-16.

Devine-Wright, Patrick. "Beyond NIMBYism: towards an integrated framework for understanding public perceptions of wind energy." *Wind Energy: An International Journal for Progress and Applications in Wind Power Conversion Technology* 8, no. 2 (2005): 125-139.

Devine-Wright, Patrick. "Rethinking NIMBYism: The role of place attachment and place identity in explaining place-protective action." *Journal of community & applied social psychology* 19, no. 6 (2009): 426-441.

Devine-Wright, Patrick, and Yuko Howes. "Disruption to place attachment and the protection of restorative environments: A wind energy case study." *Journal of environmental psychology* 30, no. 3 (2010): 271-280.

Devine-Wright, Patrick. "Explaining "NIMBY" objections to a power line: The role of personal, place attachment and project-related factors." *Environment and Behavior* 45, no. 6 (2014): 761-781.

Dorrell, John, and Keunjae Lee. "The cost of wind: Negative economic effects of global wind energy development." *Energies* 13, no. 14 (2020): 3667.

Drewitt, Allan L., and Rowena HW Langston. "Assessing the impacts of wind farms on birds." Ibis 148 (2006): 29-42.

Database of State Incentives for Renewables & Efficiency (DSIRE). "Programs." *NC State University*, 2019. Programs.dsireusa.org.

Ellis, Randy. "Wind farm abandons tax avoidance tactic that threatened school funding." *The Oklahoman*, 2018. https://oklahoman.com/article/5614504/wind-farm-abandons-tax-avoidance-tactic-that-threatened-school-funding (Accessed 30 Jul 2019).

Ellis, Geraint, and Gianluca Ferraro. "The social acceptance of wind energy." *Where we stand and the path ahead. JRC Science for policy report. European Commission, Brussels* (2016).

Eltham, Douglas C., Gareth P. Harrison, and Simon J. Allen. "Change in public attitudes towards a Cornish wind farm: Implications for planning." *Energy Policy* 36, no. 1 (2008): 23-33.

England, J. Lynn, and Stan L. Albrecht. "Boomtowns and social disruption." *Rural Sociology* 49, no. 2 (1984): 230.

Environmental Protection Agency (EPA). "Greenhouse Gases Equivalencies Calculator – Calculations and References." 2019. https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references.

Envision Woodward: City of Woodward, OK Comprehensive Plan. 2014. PDF. Accessed 8 Apr. 2018. http://www.cityofwoodward.com/DocumentCenter/Home/View/144.

Erickson, Wallace P., Gregory D. Johnson, and P. David Jr. "A summary and comparison of bird mortality from anthropogenic causes with an emphasis on collisions." In *In: Ralph, C. John; Rich, Terrell D., editors 2005. Bird Conservation Implementation and Integration in the Americas: Proceedings of the Third International Partners in Flight Conference. 2002 March 20-24; Asilomar, California, Volume 2 Gen. Tech. Rep. PSW-GTR-191. Albany, CA: US Dept. of Agriculture, Forest Service, Pacific Southwest Research Station: p. 1029-1042*, vol. 191. 2005.

Everett, Dianna. "Woodward County." 2019. *The Encyclopedia of Oklahoma History and Culture.* Accessed 5 Mar. 2019. https://www.okhistory.org/publications/enc/entry.php?entry=WO017.

Fast, Stewart, and Warren Mabee. "Place-making and trust-building: The influence of policy on host community responses to wind farms." *Energy Policy* 81 (2015): 27-37.

Fergen, Joshua, and Jeffrey B. Jacquet. "Beauty in motion: Expectations, attitudes, and values of wind energy development in the rural US." *Energy Research & Social Science* 11 (2016): 133-141.

Ferrell, Shannon, and Joshua Conaway. "Wind Energy Industry Impacts in Oklahoma." *State Chamber of Oklahoma Research Foundation, November* (2015).

Flick, Uwe. "Concepts of triangulation." *Managing quality in qualitative research* (2007): 38-54.

Frantál, Bohumil. "Have local government and public expectations of wind energy project benefits been met? Implications for repowering schemes." *Journal of Environmental Policy & Planning* 17, no. 2 (2015): 217-236.

Frantál, Bohumil, Dan Van der Horst, Josef Kunc, and Martina Jaňurová. "Landscape disruption or just a lack of economic benefits? Exploring factors behind the negative perceptions of wind turbines." *TÁJÖKOLÓGIAI LAPOK* 15, no. 2 (2017): 139-147.

Freudenberg William, R., and K. Pastor Susan. "LULUs: stalking the syndromes." *Journal of Social Issues* 48, no. 4 (1992): 39-61.

Fusch, Patricia, Gene E. Fusch, and Lawrence R. Ness. "Denzin's paradigm shift: Revisiting triangulation in qualitative research." *Journal of Social Change* 10, no. 1 (2018): 2.

Gibbons, Stephen. "Gone with the wind: Valuing the visual impacts of wind turbines through house prices." *Journal of Environmental Economics and Management* 72 (2015): 177-196.

Global Wind Energy Council (GWEC). "GWEC Windsights." Updated March 2019. https://gwec.net/windsights/.

Greene, John Scott, and Mark Geisken. "Socioeconomic impacts of wind farm development: a case study of Weatherford, Oklahoma." *Energy, Sustainability and Society* 3, no. 1 (2013): 2.

Greene, J. Scott, and Mark Morrissey. "Estimated pollution reduction from wind farms in Oklahoma and associated economic and human health benefits." *Journal of Renewable Energy* 2013 (2013).

Greenland, Noah, Taylor Jones, and Rebecca Bullis. “Lawsuit launched to Protect Imperiled Lesser Prairie Chicken: Western Bird Face Threats from Climate Change, Fossil Fuel Extraction.” *Center for Biological Diversity*, 2019. https://www.biologicaldiversity.org/news/press_releases/2019/lesser-prairie-chicken-02-14-2019.php.

Gross, Catherine. "Community perspectives of wind energy in Australia: The application of a justice and community fairness framework to increase social acceptance." *Energy policy* 35, no. 5 (2007): 2727-2736.

Groth, Theresa M., and Christine Vogt. "Residents' perceptions of wind turbines: An analysis of two townships in Michigan." *Energy Policy* 65 (2014): 251-260.

Hagen, Christian A. "Impacts of energy development on prairie grouse ecology: a research synthesis." In *Transactions of North American Wildlife and Natural Resource Conference*, vol. 75, pp. 96-103. 2010.

Hagen, Christian A. and Kenneth M. Giesen. "Lesser Prairie-chicken (Tympanuchus pallidicinctus), version 2.0" in *The birds of North America* 364 (2005): 20. https://birdsoftheworld-org.ezproxy.lib.ou.edu/bow/historic/bna/lepchi/2.0/introduction.

Haggerty, Julia, Mark N. Haggerty, Ray Rasker, and Patricia Gude. "County Economic Development at a Glance: A Single Measure of Opportunity." In *Western Economics Forum*, vol. 13, no. 1837-2016-151823, pp. 1-7. 2014.

Handy, Ryan Maye. “In Oklahoma, a war over wind power.” Houston Chronicle, 2018. https://www.houstonchronicle.com/business/article/In-Oklahoma-a-war-over-wind-power-12612928.php.

Harding, Graham, Pamela Harding, and Arnold Wilkins. "Wind turbines, flicker, and photosensitive epilepsy: Characterizing the flashing that may precipitate seizures and optimizing guidelines to prevent them." *Epilepsia* 49, no. 6 (2008): 1095-1098.

Harrison, Jocelyn Olney, Mary B. Brown, Larkin A. Powell, Walter H. Schacht, and Jennifer A. Smith. "Nest site selection and nest survival of Greater Prairie-Chickens near a wind energy facility." *The Condor: Ornithological Applications* 119, no. 4 (2017): 659-672.

Harvey, William S. "Strategies for conducting elite interviews." *Qualitative research* 11, no. 4 (2011): 431-441.

Hayes, Mark A. "Bats killed in large numbers at United States wind energy facilities." *BioScience* 63, no. 12 (2013): 975-979.

Heckathorn, Douglas D. "Respondent-driven sampling: a new approach to the study of hidden populations." *Social problems* 44, no. 2 (1997): 174-199.

Heintzelman, Martin D., and Carrie M. Tuttle. "Values in the wind: a hedonic analysis of wind power facilities." *Land Economics* 88, no. 3 (2012): 571-588.

Heggie, Jon. “Oklahoma: how wind is re-energizing the state’s economy.” *National Geographic*, 2020. https://www.nationalgeographic.com/science/2020/02/partner-content-wind-re-energizing-state-economy/.

Hess, David J., and Haley Gentry. "100% renewable energy policies in US cities: strategies, recommendations, and implementation challenges." *Sustainability: Science, Practice and Policy* 15, no. 1 (2019): 45-61.

“History of Woodward.” 2019. *The Plains Indians & Pioneers Museum*. Accessed 16 Mar. 2019. http://www.nwok-pipm.org/history-of-woodward-ok.

Hirsh, Richard F., and Benjamin K. Sovacool. "Wind turbines and invisible technology: unarticulated reasons for local opposition to wind energy." *Technology and Culture* 54, no. 4 (2013): 705-734.

Hoen, Ben, Ryan Wiser, Peter Cappers, Mark Thayer, and Gautam Sethi. "Wind energy facilities and residential properties: the effect of proximity and view on sales prices." *Journal of Real Estate Research* 33, no. 3 (2011): 279-316.

Hoen, Ben D., Jason P. Brown, Thomas Jackson, Mark A. Thayer, Ryan Wiser, and Peter Cappers. "Spatial hedonic analysis of the effects of US wind energy facilities on surrounding property values." *The Journal of Real Estate Finance and Economics* 51, no. 1 (2015): 22-51.

Hoen, Ben D., Diffendorfer, J.E., Rand, J.T., Kramer, L.A., Garrity, C.P., Hunt, H.E. “United States Wind Turbine Database. U.S. Geological Survey.” *American Wind Energy Association, and Lawrence Berkeley National Laboratory* data release: USWTDB V2.3. January 2020. https://eerscmap.usgs.gov/uswtdb.

Hoen, Ben, Joseph Rand, Ryan Wiser, Jeremy Firestone, Debi Elliott, Gundula Hübner, Johannes Pohl et al. "National Survey of Attitudes of Wind Power Project Neighbors: Summary of Results." *Berkeley, CA: Lawrence Berkeley National Laboratory* (2018).

Holloway, Immy, and Francis C. Biley. "Being a qualitative researcher." *Qualitative health research* 21, no. 7 (2011): 968-975.

Holmes, Amanda. "Methodology: Using semi-structured interviews as the data gathering tool in a case study approach to research." In *Bridging the Gap between Ideas and Doing Research: Proceedings of the 3rd Annual Postgraduate Research Conference*. University of New England, 2009.

Holt, Amanda. "Using the telephone for narrative interviewing: a research note." *Qualitative research* 10, no. 1 (2010): 113-121.

Horton, R., L. Bell, C. M. O'Meilia, M. McLachlan, C. Hise, D. Wolfe, D. Elmore, and J. D. Strong. "A spatially-based planning tool designed to reduce negative effects of development on the Lesser Prairie-Chicken (Tympanuchus pallidicinctus) in Oklahoma: A multi-entity collaboration to promote Lesser Prairie-Chicken voluntary habitat conservation and prioritized management actions." *Oklahoma Department of Wildlife Conservation. Oklahoma City, Oklahoma. 79pp.* Available online at: http://www. wildlifedepartment. com/lepcdevelopmentplanning. htm (2010).

Hovick, Torre J., J. Matthew Carroll, R. Dwayne Elmore, Craig A. Davis, and Samuel D. Fuhlendorf. "Restoring fire to grasslands is critical for migrating shorebird populations." *Ecological Applications* 27, no. 6 (2017): 1805-1814.

Hunt, Gary L. "The impact of oil price fluctuations on the economies of energy producing states." *Review of Regional Studies* 17, no. 3 (1987): 60-76.

International Energy Agency (IEA). "Perspectives for the Energy Transition - Investment Needs for a Low-Carbon Energy System." 2017. https://webstore.iea.org/perspectives-for-the-energy-transition-investment-needs-for-a-low-carbon-energy-system.

Jaber, Suaad. "Environmental impacts of wind energy." *Journal of Clean Energy Technologies* 1, no. 3 (2013): 251-254.

Jacquet, Jeffrey B. "Landowner attitudes toward natural gas and wind farm development in northern Pennsylvania." *Energy Policy* 50 (2012): 677-688.

Jacquet, Jeffrey B., and Richard C. Stedman. "Perceived impacts from wind farm and natural gas development in northern Pennsylvania." *Rural Sociology* 78, no. 4 (2013): 450-472.

James, Louise Boyd. "Woodward: First Century on the Sand-Sage Prairie 1887-1987." *Chronicles of Oklahoma* LXIV, no. 3 (1986). http://www.usgennet.org/usa/ok/county/woodward/history/sage.html.

James, Louise Boyd. "Jujubes, Grapes, & Grass: The USDA Research Station at Woodward, 1913–1987." *Chronicles of Oklahoma* 65, no. 4 (1988): 354-379.

Jepson, Wendy, Christian Brannstrom, and Nicole Persons. "“We Don’t Take the Pledge”: Environmentality and environmental skepticism at the epicenter of US wind energy development." *Geoforum* 43, no. 4 (2012): 851-863.

Jessup, Brad. "Plural and hybrid environmental values: a discourse analysis of the wind energy conflict in Australia and the United Kingdom." *Environmental Politics* 19, no. 1 (2010): 21-44.

Johansson, Maria, and Thorbjörn Laike. "Intention to respond to local wind turbines: the role of attitudes and visual perception." *Wind Energy: An International Journal for Progress and Applications in Wind Power Conversion Technology* 10, no. 5 (2007): 435-451.

Kahn, Matthew E. "Local non-market quality of life dynamics in new wind farms communities." *Energy Policy* 59 (2013): 800-807.

Kammen, Daniel M. "The rise of renewable energy." *Scientific American* 295, no. 3 (2006): 84-93.

Karl, Terry Lynn. "Oil-led development: social, political, and economic consequences." *Encyclopedia of energy* 4, no. 8 (2007): 661-672.

Karmazina, Anna. "Community Mobilization in Support and Opposition of Wind Energy Development: Evidence from Wasco and Sherman Counties, Oregon." (2016).

Karunathilake, Hirushie, Piyaruwan Perera, Rajeev Ruparathna, Kasun Hewage, and Rehan Sadiq. "Renewable energy integration into community energy systems: A case study of new urban residential development." *Journal of Cleaner Production* 173 (2018): 292-307.

Keating, Frank. “Frank Keating: I signed wind industry tax breaks, and I was wrong.” Feb 24, 2017. https://www.tulsaworld.com/opinion/columnists/frank-keating-i-signed-wind-industry-tax-breaks-and-i/article_3d48e13b-a64e-53e6-a53a-b12c932dea80.html.

Keith, David W., Joseph F. DeCarolis, David C. Denkenberger, Donald H. Lenschow, Sergey L. Malyshev, Stephen Pacala, and Philip J. Rasch. "The influence of large-scale wind power on global climate." *Proceedings of the National Academy of Sciences 101*, no. 46 (2004): 16115-16120.

Kempton, Willett, Jeremy Firestone, Jonathan Lilley, Tracy Rouleau, and Phillip Whitaker. "The offshore wind power debate: views from Cape Cod." *Coastal Management* 33, no. 2 (2005): 119-149.

Kerstetter, Katie. "Insider, Outsider, or Somewhere Between: The Impact of Researchers' Identities on the Community-Based Research Process." *Journal of Rural Social Sciences* 27, no. 2 (2012): 7.

Knopper, Loren D., and Christopher A. Ollson. "Health effects and wind turbines: A review of the literature." *Environmental Health* 10, no. 1 (2011): 78.

Knopper, Loren D., Christopher A. Ollson, Lindsay C. McCallum, Melissa L. Whitfield Aslund, Robert G. Berger, Kathleen Souweine, and Mary McDaniel. "Wind turbines and human health." *Frontiers in Public Health* 2 (2014): 63.

Koh, Young-Kon. "Analysis of Oklahoma's boom and bust economy by means of a CGE model." PhD diss., Oklahoma State University, 1991.

Krijgsveld, Karen L., Kirsten Akershoek, Femke Schenk, Femke Dijk, and Sjoerd Dirksen. "Collision risk of birds with modern large wind turbines." *Ardea* 97, no. 3 (2009): 357-366.

Krohn, Søren, and Steffen Damborg. "On public attitudes towards wind power." *Renewable Energy* 16, no. 1-4 (1999): 954-960.

Kunz, Thomas H., Edward B. Arnett, Wallace P. Erickson, Alexander R. Hoar, Gregory D. Johnson, Ronald P. Larkin, M. Dale Strickland, Robert W. Thresher, and Merlin D. Tuttle. "Ecological impacts of wind energy development on bats: questions, research needs, and hypotheses." Frontiers in Ecology and the Environment 5, no. 6 (2007): 315-324.

Landry, Mathieu A., André Leclerc, and Yves Gagnon. "A methodology for the evaluation of the economic impacts of wind energy projects." *Energy & Environment* 24, no. 5 (2013): 735-748.

Lantz, Eric. "Economic Development Benefits from Wind Power in Nebraska: A Report for the Nebraska Energy Office." *US Department of Energy Publications* (2008): 24.

Lawrie, Misty, Matthew Tonts, and Paul Plummer. "Boomtowns, resource dependence and socio-economic well-being." *Australian Geographer* 42, no. 2 (2011): 139-164.

Leistritz, F. Larry, and Randal C. Coon. "Socioeconomic impacts of developing wind energy in the great plains." *Great Plains Research* (2009): 3-12.

Leung, Dennis YC, and Yuan Yang. "Wind energy development and its environmental impact: A review." *Renewable and Sustainable Energy Reviews* 16, no. 1 (2012): 1031-1039.

Lewis, Peirce. "Axioms for reading the landscape." *The interpretation of ordinary landscapes* 23 (1979): 167-187.

Lincoln, Yvonna S., and Egon G. Guba. "Naturalistic inquiry (vol. 75)." (1985).

Londe, David W., Samuel D. Fuhlendorf, R. Dwayne Elmore, Craig A. Davis, and Jimmy Rutledge. "Female Greater Prairie-Chicken response to energy development and rangeland management." *Ecosphere* 10, no. 12 (2019): e02982.

Loss, Scott R., Tom Will, and Peter P. Marra. "Estimates of bird collision mortality at wind facilities in the contiguous United States." *Biological Conservation* 168 (2013): 201-209.

Lothian, Andrew. "Scenic perceptions of the visual effects of wind farms on South Australian landscapes." *Geographical Research* 46, no. 2 (2008): 196-207.

Makhijani, Arjun. *Carbon-free and nuclear-free: A roadmap for US energy policy*. RDR Books, 2007.

Malone, Tara. “Bird On A Wire.” *Oklahoma Magazine*. November 28, 2011. https://okmag.com/blog/bird_on_a_wire/?amp.

Martin, John, and Doug Ramsey. "The economics of wind energy." *Journal of Applied Corporate Finance* 21, no. 2 (2009): 100-109.

Mathers, Nigel Joseph, Nicholas Jeremy Fox, and Amanda Hunn. *Using interviews in a research project*. NHS Executive, Trent, 1998.

May, Nils, and Øivind Anti Nilsen. "The Local Economic Impact of Wind Power Deployment." *NHH Dept. of Economics Discussion Paper* 9 (2015).

McMillan, John, and Christopher Woodruff. "The central role of entrepreneurs in transition economies." *Journal of economic Perspectives* 16, no. 3 (2002): 153-170.

McNew, Lance B., Lyla M. Hunt, Andrew J. Gregory, Samantha M. Wisely, and Brett K. Sandercock. "Effects of wind energy development on nesting ecology of greater

prairie-chickens in fragmented grasslands." *Conservation Biology* 28, no. 4 (2014): 1089-1099.

Meo, Mark. "The Oklahoma Wind Rush: A Collaborative Approach to Sustainable Energy Development." In *Workshop on Energy, Environmental Impacts, and Sustainability.* Manhattan, KS: Kansas State University, 2006.

Michaels, Robert, Per Byland, Paul Knappenberger, and Byron Schlomach. "Wind Energy in Oklahoma: A Costly Solution in Search of a Problem." *1889 Institute*, Oklahoma State University, 2017.

Mitchell, Don. "Cultural landscapes: the dialectical landscape–recent landscape research in human geography." *Progress in human geography* 26, no. 3 (2002): 381-389.

Mitchell, Don. "New axioms for reading the landscape: paying attention to political economy and social justice." In *Political economies of landscape change*, pp. 29-50. Springer, Dordrecht, 2008.

Molnarova, Kristina, Petr Sklenicka, Jiri Stiborek, Kamila Svobodova, Miroslav Salek, and Elizabeth Brabec. "Visual preferences for wind turbines: Location, numbers and respondent characteristics." *Applied Energy* 92 (2012): 269-278.

Monies, Paul. "Oklahoma legislators debate property tax exemption for manufacturing, wind farms." *The Oklahoman*, 2015. https://oklahoman.com/article/5392096/oklahoma-legislators-debate-property-tax-exemption-for-manufacturing-wind-farms.

Mroczek, Bożena, Donata Kurpas, and Magdalena Klera. "Sustainable development and wind farms." *Problemy Ekorozwoju–Problems of Sustainable Development* 8, no. 2 (2013): 113-122.

Mulvaney, Kate K., Patrick Woodson, and Linda Stalker Prokopy. "A tale of three counties: Understanding wind development in the rural Midwestern United States." *Energy Policy* 56 (2013): 322-330.

Munday, Max, Gill Bristow, and Richard Cowell. "Wind farms in rural areas: How far do community benefits from wind farms represent a local economic development opportunity?" *Journal of Rural Studies* 27, no. 1 (2011): 1-12.

Mussmann, S. M., M. R. Douglas, W. J. B. Anthonysamy, Mark Allen Davis, S. A. Simpson, W. Louis, and M. E. Douglas. "Genetic rescue, the greater prairie chicken and the problem of conservation reliance in the Anthropocene." *Royal Society open science* 4, no. 2 (2017): 160736.

National Conference of State Legislatures (NCSL). "State Renewable Portfolio Standards and Goals." December 31, 2019. https://www.ncsl.org/research/energy/renewable-portfolio-standards.aspx.

National Renewable Energy Laboratory (NREL). "Wind Maps." https://www.nrel.gov/gis/wind.html (Accessed 13 Mar. 2019).

National Renewable Energy Laboratory (NREL). "Limitations of JEDI Models." https://www.nrel.gov/analysis/jedi/limitations.html. Accessed March 2020.

National Wind Watch. "Title." 2019. https://m.wind-watch.org/sitemap.php.

Neri, Marlon, Davi Jameli, Enrico Bernard, and Felipe PL Melo. "Green versus green? Adverting potential conflicts between wind power generation and biodiversity conservation in Brazil." *Perspectives in Ecology and Conservation* 17, no. 3 (2019): 131-135.

NextEra Energy Resources. "Oklahoma Wind Energy Center." 2019. http://www.nexteraenergyresources.com/content/where/portfolio/pdf/oklahoma.pdf (Accessed 8 Mar. 2019).

NextEra Energy Resources. "Supporting Communities." 2020. https://www.nexteraenergyresources.com/company/community/support.html (Accessed 30 Oct. 2020).

Okafor, E. Emeka. "Triangulation of Methods in Labour Studies in Nigeria: Reflections on the Benefits and Challenges." *African Research Review* 7, no. 2 (2013): 61-80.

Oklahoma Department of Commerce. "Demographic State of the State." 1989.

Oklahoma Geological Survey (OGS). "Oil and Gas." Last modified Nov 18, 2019. http://www.ou.edu/ogs/research/energy/oil-gas (accessed November 23, 2019).

Oklahoma Historical Preservation Society (OHPS). *Architectural/Historical Reconnaissance Level Survey of Certain Portions of the City of Woodward* (Report). 1996. https://www.okhistory.org/shpo/architsurvey/RLSofPortionofWoodwardPt1.pdf.

Oklahoma Policy Institute (OKPolicy). "Ad Valorem Manufacturing Exemption." July 10, 2019. https://okpolicy.org/ad-valorem-manufacturing-exemption/ (accessed December 28, 2019).

Oklahoma Power Alliance. "Oklahoma Tax Credits." 2019. https://okpoweralliance.com/economic-impact/oklahoma-tax-credits/.

Oklahoma State Senate. "2009 Legislative Summary and FY' 10 Budget Review." http://www.oksenate.gov/publications/legislative_summary/2009_legislative_summary.pdf.

Overall, Michael. "Wind farms in Oklahoma: Your tax money helps pay for it, but is it worth the price?" *Tulsa World*, 2015. Accessed 12 Jul 2019. https://www.tulsaworld.com/news/local/government-and-politics/wind-farms-in-oklahoma-your-tax-money-helps-pay-for/article_38d758fb-4908-59d2-b9ca-9f9cdbc961b6.html.

Pidala, Nicole. "Public Perceptions of Wind Energy in Vermont: The Role of Physical, Social, and Environmental Parameters in the Vermont Wind Energy Debate." PhD Thesis, University of Vermont, 2017.

Pedersen, Eja, and Kerstin Persson Waye. "Perception and annoyance due to wind turbine noise—a dose–response relationship." *The Journal of the Acoustical Society of America* 116, no. 6 (2004): 3460-3470.

Peterson, David AM, Kristy C. Carter, Dara M. Wald, William Gustafson, Sidney Hartz, Jacob Donahue, Joe R. Eilers et al. "Carbon or cash: Evaluating the effectiveness of environmental and economic messages on attitudes about wind energy in the United States." *Energy Research & Social Science* 51 (2019): 119-128.

Petrova, Maria A. "NIMBYism revisited: public acceptance of wind energy in the United States." *Wiley Interdisciplinary Reviews: Climate Change* 4, no. 6 (2013): 575-601.

Petrova, Maria A. "From NIMBY to acceptance: Toward a novel framework—VESPA—For organizing and interpreting community concerns." *Renewable energy* 86 (2016): 1280-1294.

Piorkowski, Martin Daniel. "Breeding bird habitat use and turbine collisions of birds and bats located at a wind farm in Oklahoma mixed-grass prairie." Master's Thesis, Oklahoma State University, 2006.

Piorkowski, Martin D., and Timothy J. O'Connell. "Spatial pattern of summer bat mortality from collisions with wind turbines in mixed-grass prairie." *The American midland naturalist* 164, no. 2 (2010): 260-269.

Pruett, Christin L., Michael A. Patten, and Donald H. Wolfe. "It's not easy being green: wind energy and a declining grassland bird." *BioScience* 59, no. 3 (2009a): 257-262.

Pruett, Christin L., Michael A. Patten, and Donald H. Wolfe. "Avoidance behavior by prairie grouse: implications for development of wind energy." *Conservation Biology* 23, no. 5 (2009b): 1253-1259.

Qu, Sandy Q., and John Dumay. "The qualitative research interview." *Qualitative research in accounting & management* (2011).

Rand, Joseph, and Ben Hoen. "Thirty years of North American wind energy acceptance research: What have we learned?." *Energy research & social science* 29 (2017): 135-148.

Reynolds, Clare. "Oklahomans' Perceptions of Wind Energy." University of Oklahoma, Master's Thesis, 2012.

Ricks, Rowynn. "Siemens bringing wind service distribution center to Woodward." May 23, 2011. *Woodward News*. https://www.woodwardnews.net/news/local_news/siemens-bringing-wind-service-distribution-center-to-woodward/article_8eb31b52-3b9d-5ef4-8204-0f46ad29584e.html.

Righter, Robert W. *Wind Energy in America: A History*. Norman: University of Oklahoma Press, 1996.

Robel, R. J. "Expected impacts on greater prairie-chickens of establishing a wind turbine facility near Rosalia, Kansas." *Unpublished report to Zilkha Renewable Energy* (2002).

Robertson, Kent A. "Can small-city downtowns remain viable? A national study of development issues and strategies." *Journal of the American Planning Association* 65, no. 3 (1999): 270-283.

Robson, Frank. "Anti-wind advocate: Many misconceptions about benefits of wind industry in Oklahoma." The Oklahoman. March 11, 2017. https://www.wind-watch.org/news/2017/03/11/anti-wind-advocate-many-misconceptions-about-benefits-of-wind-industry-in-oklahoma/.

Rogers, Anthony L., and James F. Manwell. "Wind turbine noise issues." *Amherst, University of Massachusetts at Amherst* (2004).

Rust, Malinda. "Taxes and wind: Local assessment lawsuit going to court." *The Lawton Constitution*, 2015. https://www.swoknews.com/local/taxes-and-wind (Accessed 20 May 2019).

Ryan, Gery W., and H. Russell Bernard. "Techniques to identify themes in qualitative data." *Handbook of Qualitative Research. 2nd ed. Thousand Oaks, CA: Sage Publications* (2000).

Saidur, Rahman, N. A. Rahim, M. R. Islam, and K. H. Solangi. "Environmental impact of wind energy." *Renewable and sustainable energy reviews* 15, no. 5 (2011): 2423-2430.

Samms, Grant Perry. "The Saudi Arabia of Wind: Energy Identities and Conflict in a Historic Oil Town." Oklahoma State University, Master's Thesis, 2016.

Savage, Tres. "Woodward has two concerns: COVID and the economy." NONDOC Media, LLC. August 19, 2020. https://nondoc.com/2020/08/19/woodward-has-two-concerns-covid-and-the-economy/.

Selman Guest Ranch. 2020. http://www.selmanguestranch.com.

Schlegel, Dennis. "Primary Research: Expert Interviews." In *Cost-of-Capital in Managerial Finance*, pp. 117-146. Springer, Cham, 2015.

Schumacher, Kim, and Zhuoxiang Yang. "The determinants of wind energy growth in the United States: Drivers and barriers to state-level development." *Renewable and Sustainable Energy Reviews* 97 (2018): 1-13.

Shoeib, Eman. "The Influence of Wind Power on Rural Areas Economic, Demographic, and Community Services Impacts." University of Massachusetts Amherst, Doctoral Dissertation, 2019.

Siemens Energy. "Siemens Opens U.S. Wind Service Distribution Center in Woodward, Oklahoma." Feb 16, 2012. https://www.prnewswire.com/news-releases/siemens-opens-us-wind-service-distribution-center-in-woodward-oklahoma-139478503.html.

Slattery, Michael C., Eric Lantz, and Becky L. Johnson. "State and local economic impacts from wind energy projects: Texas case study." *Energy Policy* 39, no. 12 (2011): 7930-7940.

Slattery, Michael C., Becky L. Johnson, Jeffrey A. Swofford, and Martin J. Pasqualetti. "The predominance of economic development in the support for large-scale wind farms in the US Great Plains." *Renewable and Sustainable Energy Reviews* 16, no. 6 (2012): 3690-3701.

Smallwood, K. Shawn. "Comparing bird and bat fatality-rate estimates among North American wind-energy projects." *Wildlife Society Bulletin* 37, no. 1 (2013): 19-

33.

Smedley, Andrew RD, Ann R. Webb, and Arnold J. Wilkins. "Potential of wind turbines to elicit seizures under various meteorological conditions." *Epilepsia* 51, no. 7 (2010): 1146-1151.

Smith, Joanna, and Helen Noble. "Bias in research." *Evidence-based nursing* 17, no. 4 (2014): 100-101.

Snead, Mark C., and Suzette Dragoo Barta. *The Economic Impact of Oil and Gas production and Drilling on the Oklahoma Economy*. Oklahoma Commission on Marginally Producing Oil and Gas Wells, 2002.

Snead, Mark C., and Amy A. Jones. *Oklahoma Oil and Gas Activity and Tax Contribution*. State Chamber Research Foundation, 2019.

Sovacool, Benjamin K. "Contextualizing avian mortality: A preliminary appraisal of bird and bat fatalities from wind, fossil-fuel, and nuclear electricity." *Energy Policy* 37, no. 6 (2009): 2241-2248.

Stoeglehner, Gernot, Georg Neugebauer, Susanna Erker, and Michael Narodoslawsky. *Integrated spatial and energy planning: supporting climate protection and the energy turn with means of spatial planning*. Springer, 2016.

Sullivan, Robert G., L. Kirchler, Tom Lahti, Sherry Roché, Kevin Beckman, Brian Cantwell, and Pamela Richmond. "Wind turbine visibility and visual impact threshold distances in western landscapes." In *National Association of Environmental Professionals 37th Annual Conference, May*, pp. 21-24. 2012.

Sutter, John D. “Woodward County, Oklahoma: Why do so many here doubt climate change.” November 24, 2015. *CNN*. https://www.cnn.com/2015/08/03/opinions/sutter-climate-skeptics-woodward-oklahoma/index.html.

Swofford, Jeffrey, and Michael Slattery. "Public attitudes of wind energy in Texas: Local communities in close proximity to wind farms and their effect on decision-making." *Energy policy* 38, no. 5 (2010): 2508-2519.

Thurmond, Veronica A. "The point of triangulation." *Journal of nursing scholarship* 33, no. 3 (2001): 253-258.

Turner, Charles, and Elizabeth Martin. *Surveying subjective phenomena*. Vol. 2. Russell Sage Foundation, 1985.

Umit, Resul, and Lena Maria Schaffer. "Wind Turbines, Public Acceptance, and Electoral Outcomes." (2020).

U.S. Census Bureau. “Population of States and Counties of the United States: 1790 to 1990.” 1996. https://www.census.gov/population/www/censusdata/PopulationofStatesandCountiesoftheUnitedStates1790-1990.pdf. (accessed February 2020).

U.S. Department of Energy (DOE). "Wind Vision: A New Era for Wind Power in the United States." *Executive summary March 2015. Report nr DOE/GO-102015–4557, 50 pp* (2015).

U.S. Department of Energy (DOE). “World Oil Price, 1970-2020.” March 5, 2001. https://www.energy.gov/sites/prod/files/maprod/documents/nepdg_8501_8750.pdf (accessed December 22, 2019).

U.S. Department of Energy (DOE). “Wind Energy in Oklahoma.” 2019. https://windexchange.energy.gov/states/ok (accessed July 18, 2019).

U.S. Department of Energy (DOE). “Advantages and Challenges of Wind Energy.” 2020a. https://www.energy.gov/eere/wind/advantages-and-challenges-wind-energy (accessed January 2020).

U.S. Department of Energy (DOE). “Wind Energy’s Economic Impacts to Communities.” 2020b. (accessed September 28, 2020) https://windexchange.energy.gov/projects/economic-impacts.

U.S. Energy Information Administration (EIA). “Four states account for more than half of U.S. wind electricity generation.” June 7, 2019-a. https://www.eia.gov/todayinenergy/detail.php?id=39772 (accessed December 20, 2019).

U.S. Energy Information Administration (EIA). “Oklahoma State Profile and Energy Estimates.” Last modified June 28, 2019-b. https://www.eia.gov/state/?sid=OK#tabs-3 (accessed November 16, 2019).

U.S. Energy Information Administration (EIA). “Petroleum & Other Liquids.” February 2, 2020. https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=f002040__3&f=a (accessed February 2020).

U.S. Wind Turbine Database (USWTDB). “Data & Web Services.” 2019. USGS. https://eerscmap.usgs.gov/uswtdb/data/.

U.S. Wind Turbine Database (USWTDB). “Data and Web Services.” USGS. https://eerscmap.usgs.gov/uswtdb/data/ (accessed February 2020).

Van der Horst, Dan. "NIMBY or not? Exploring the relevance of location and the politics of voiced opinions in renewable energy siting controversies." *Energy policy* 35, no. 5 (2007): 2705-2714.

Van Pelt, William E., Sean Kyle, Jim Pitman, David Klute, Grant Beauprez, Doug Schoeling, Allan Janus, and J. Haufler. "The lesser prairie-chicken range-wide conservation plan." *Western Association of Fish and Wildlife Agencies, Cheyenne, Wyoming, USA* (2013).

VanWynsberghe, Rob, and Samia Khan. "Redefining case study." *International Journal of Qualitative Methods* 6, no. 2 (2007): 80-94.

Walker, Chad, and Jamie Baxter. "“It's easy to throw rocks at a corporation”: wind energy development and distributive justice in Canada." *Journal of Environmental Policy & Planning* 19, no. 6 (2017): 754-768.

Wallach, Bret. *A World Made for Money: Economy, Geography, and the Way We Live Today*. U of Nebraska Press, 2015.

Warren, Charles R., Carolyn Lumsden, Simone O'Dowd, and Richard V. Birnie. "‘Green on green’: public perceptions of wind power in Scotland and Ireland." *Journal of environmental planning and management* 48, no. 6 (2005): 853-875.

Wertz, Joe. “Fallin Signs Bill to End Tax Credit That Helped Fuel Oklahoma’s Wind-Energy Boom.” April 18, 2017. https://stateimpact.npr.org/oklahoma/2017/04/18/fallin-signs-bill-to-end-tax-credit-that-helped-fuel-oklahomas-wind-energy-boom/.

Wheeler, Stephen M. "State and municipal climate change plans: the first generation." *Journal of the American Planning Association* 74, no. 4 (2008): 481-496.

White, Scott. “Oklahoma Wind Energy Projects.” 2016. Kansasenergy.org. Accessed 21 Apr. 2018. http://www.kansasenergy.org/wind_projects_OK.htm.

Wiener, Joshua G., and Tomas M. Koontz. "Shifting winds: Explaining variation in state policies to promote small-scale wind energy." *Policy Studies Journal* 38, no. 4 (2010): 629-651.

Wilkinson, Kenneth P., James G. Thompson, Robert R. Reynolds Jr, and Lawrence M. Ostresh. "Local social disruption and western energy development: A critical review." *Pacific Sociological Review* 25, no. 3 (1982): 275-296.

Wilson, Geoff A., and Sarah L. Dyke. "Pre-and post-installation community perceptions of wind farm projects: the case of Roskrow Barton (Cornwall, UK)." *Land Use Policy* 52 (2016): 287-296.

Windfall Coalition, The. "The History of the Wind Tax Credit." 2016. http://www.thewindfallcoalition.com/facts.html#hightlights4 (accessed January 12, 2020).

Wind Waste. "About." https://windwaste.com/. Accessed February 2020.

Wind Waste. "Taxpayers Funded 80% of Wind Ad Valorem in 2017." 2020. https://windwaste.com/2018/02/12/taxpayers-funded-80-wind-ad-valorem-2017/.

Winder, V. L., L. B. McNew, A. J. Gregory, L. M. Hunt, Samantha M. Wisely, and Brett K. Sandercock. "Space use by female Greater Prairie-Chickens in response to wind energy development." *Ecosphere* 5, no. 1 (2014): 1-17.

Wiser, Ryan H., Mark Bolinger, Ben Hoen, Dev Millstein, Joseph Rand, Galen L. Barbose, Naïm R. Darghouth et al. *Wind Technology Data and Trends: Land-Based Focus, 2020 Update*. Lawrence Berkeley National Lab f(LBNL), Berkeley, CA (United States), 2020.

Wolfe, Donald H., Lena C. Larsson, and Michael A. Patten. "The Lesser Prairie-Chicken in the mixed-grass prairie ecoregion of Oklahoma, Kansas, and Texas." *Ecology and Conservation of Lesser Prairie-Chickens (DA Haukos and C. Boal, Editors). Studies in Avian Biology* 48 (2016): 299-314.

Wolsink, Maarten. "Invalid theory impedes our understanding: a critique on the persistence of the language of NIMBY." *Transactions of the Institute of British Geographers* 31, no. 1 (2006): 85-91.

Wolsink, Maarten. "Wind power implementation: the nature of public attitudes: equity and fairness instead of 'backyard motives'." *Renewable and sustainable energy reviews* 11, no. 6 (2007): 1188-1207.

"Woodward County." 2019. Accessed 4 Feb. 2019. https://woodward.okcounties.org/about.

Woodward Industrial Foundation. "Moving Woodward Forward." 2019. Wifok.com.