Assessing the Social Dynamics of Wind Energy Sites to Predict Contention among Prospective Wind Projects in Michigan

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Note

In order to protect the anonymity of research participants, all location names and maps, along with newspaper articles referencing specific projects have been removed from this version of the manuscript.

Abstract

Attitudes towards the implementation of renewable energy technologies vary in complexity as an increasing number of renewable projects are proposed in the United States and the rest of the world. These projects remain controversial, as proponents cite their positive economic impacts and potential mitigating effects on climate change, while opponents are resistant to the renewable energy transition often times for aesthetic and reliability issues. This study focuses on wind energy and the contentiousness it sparks in communities which question the impacts of having a wind turbine sited in their local community. This study seeks to determine whether it is possible to predict the factors which can resist wind energy development to better comprehend the social dynamics found at wind sites. Drawing on past research from Mills and Bessette's (2018) study, their linear regression model predicted the contention of areas harboring already existing wind energy sites, where this study tests this model on 17 selected townships in close proximity to prospective wind sites in Michigan. To assess the accuracy of Mills and Bessette's original model, a content analysis of local newspapers (N = 56) in the 17 selected townships and a semi-structured focus group with the wind developers who manage these prospective wind sites were conducted to better understand contention in the selected townships. The wind developers' perceptions were assumed to be the most accurate method of measuring the contention levels of these townships. As both the newspaper content analysis and Mills and Bessette's original model failed to closely match the contention values from the wind developers' perceptions, comments that wind developers suggested in the focus group for other factors that might impact contention were used to alter Mills and Bessette's model. After adding these factors to the original model, the revised model produced a less accurate prediction of contention for these 17 selected townships, and no clear trends were found which correlate certain variables with contention scores. Findings from this research emphasize the complexity in attempting to understand the social dynamics influencing contention underlying wind energy sites. They also highlight the importance of establishing new protocols to comprehend these diverging attitudes to better help entities achieve their clean energy policy goals.

Introduction

Wind energy has been utilized by communities as early as 5,000 B.C., where early civilizations harnessed the power of the wind to mobilize boats down the Nile River (United States Energy Information Administration, 2019). In the United States, it was not until 1939 that the first large-scale wind turbine, named "Grandpa's Knob," generated AC power to the electric grid in megawatts (Carne & III James, 2010). The 1980's brought about the first utility-scale wind farm built in California, which led to breakthroughs in innovations within the next few decades of improved design and siting of wind turbines along with increased environmental awareness by the public (Office of Energy Efficiency & Renewable Energy).

Since the 1980's, key federal and state policies have increased the scale at which wind energy is produced in the United States. The Energy Policy Act of 1992 (EPACT) increased the development of small-scale electric generation facilities, especially those using renewable energy sources. EPACT offered a production tax credit (PTC) of 1.5 cents-per-kilowatt-hour to private investors and investor-owned electric utilities for electricity production from a variety of resources including wind. It also offered a renewable energy production incentive (REPI) of the same amount to tax-exempt, publicly owned utilities, local and county governments, and rural electric cooperatives for producing electricity from resources including wind. In 1996, EPACT required that electric utilities must allow all electricity producers access to their transmission lines. This furthered the goal of restructuring the electricity industry which was originally intended to be updated with the passing of the 1978 Public Utility Regulatory Policies Act (PURPA); PURPA forced utilities to purchase a small amount of electricity from non-utility entities, especially entities using renewables. EPACT (1996) provided a channel for alternative energy producers, such as wind producers, to gain entrance into the electricity market (Menz & Vachon, 2006).

While many federal incentives promoting electricity generation from renewable energy resources were being created, state governments also adopted policies to increase the amount of electricity produced by wind and other renewable energy resources to better restructure the electricity market (Park, 2015). These policies can be categorized into three different criteria: command-and-control, market-based, and information-based (Park, 2015). Command-and-control policies are used to coerce targets authoritatively; this includes licenses, bans, and zoning (Gunningham & Sinclair, 2002) laws. Market-based policies are used by governmental authorities to change market conditions, which includes creating tax incentives (credits, expenditures, and exemptions), charges, subsidies, grants, and loans. Information policies target individuals to influence the way they think and communicate about already existing energy policies. This includes public disclosure and knowledge of green power options (Park, 2015). The 2000's brought about many of these diverse policy changes, as noted in Table 1.

Table 1: Renewable Energy Policies in Three Types of Policy Instruments: Years 2001, 2006, and 2010.

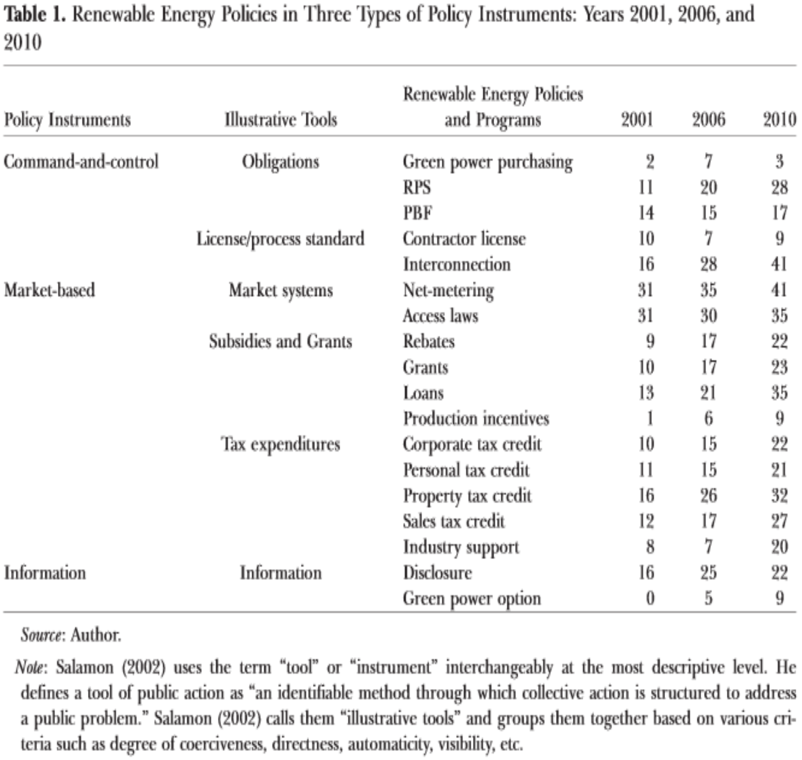


Table 1. Renewable Energy Policies in Three Types of Policy Instruments: Years 2001, 2006, and 2010

Policy Instruments	Illustrative Tools	Renewable Energy Policies and Programs	2001	2006	2010
Command-and-control	Obligations	Green power purchasing	2	7	3
		RPS	11	20	28
		PBF	14	15	17
	License/process standard	Contractor license	10	7	9
		Interconnection	16	28	41
Market-based	Market systems	Net-metering	31	35	41
		Access laws	31	30	35
	Subsidies and Grants	Rebates	9	17	22
		Grants	10	17	23
		Loans	13	21	35
		Production incentives	1	6	9
	Tax expenditures	Corporate tax credit	10	15	22
		Personal tax credit	11	15	21
		Property tax credit	16	26	32
		Sales tax credit	12	17	27
		Industry support	8	7	20
Information	Information	Disclosure	16	25	22
		Green power option	0	5	9

Source: Author.

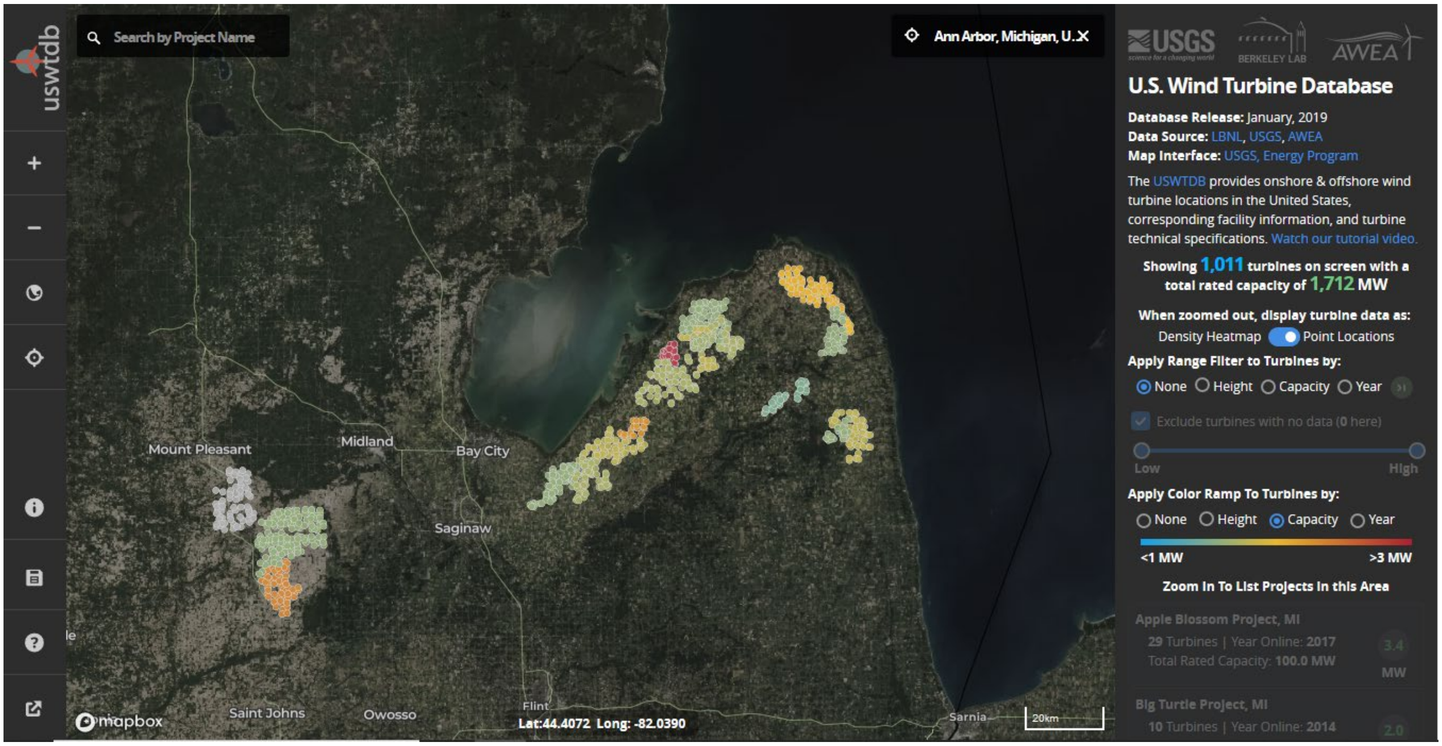
Note: Salamon (2002) uses the term "tool" or "instrument" interchangeably at the most descriptive level. He defines a tool of public action as "an identifiable method through which collective action is structured to address a public problem." Salamon (2002) calls them "illustrative tools" and groups them together based on various criteria such as degree of coerciveness, directness, automaticity, visibility, etc.

Table 1 illustrates the amount of command-and-control, market-based, and information-based policy instruments used by either federal or state governments in the years 2001, 2006, and 2010 (Database of State Incentives for Renewables and Efficiency – DSIRE). The most notable renewable energy policies and programs which have increased over the years include RPS, interconnection, net-metering, rebates, grants, loans, corporate tax credits, personal tax credits, property tax credits, sales tax credits, and industry support (Park, 2015).

Collectively, these types of policies increased the amount of electricity produced and purchased from renewable energy sources (Harringon et al, 2014). However, the influence of these policies will continue to be severely hindered by incentives and tax breaks for the fossil fuel and nuclear industry, in addition to the growing availability of oil/gas extraction making natural gas increasingly competitive with renewables. Public participation, along with favorable market conditions, will maximize the effect of renewable energy policies already in place (Park, 2015). Altogether, these efforts have made wind power economically competitive in areas where wind energy is abundant and contributes less environmental damage compared to other electricity-generating resources (U.S. Department of Energy, 2003). This has allowed for a decline in the costs of electricity generation from wind power over time because of lower production costs and more efficient wind turbines (Menz & Vachon, 2006).

In the United States, net generation from all sectors supplying wind energy increased from 6,737 thousand megawatthours (MWh) in 2001 to 254,303 thousand MWh in 2017 (United States Energy Information Administration, 2018). In Michigan, net generation from all sectors supplying wind energy increased from 0 MWh in 2001 to 5,191 thousand MWh in 2017 (United States Energy Information Administration, 2018). This statistic is approximately 2% of the total United States' net generation from all sectors supplying wind energy in 2017. The state of Michigan ranks in the top fifteen of states for installed wind capacity (American Wind Energy Association, 2019). Out of all of the energy sources Michigan uses to produce its electricity, wind energy makes up ~4.6% of total electricity production as of 2017 (United States Energy Information Administration, 2018, "Net generation for all sectors, annual"); this is equivalent to approximately 471,700 homes being powered (American Wind Energy Association, 2019). This makes wind energy the largest renewable resource for the state's own electricity generation, with all renewables totaling approximately 8% in Michigan's net electricity generation (United States Energy Information Administration, 2018, "Michigan – State Profile and Energy Estimates"). A majority of this wind energy is generated in Gratiot County and from projects located in the thumb of Michigan according to Figure 1.

Figure 1 – Majority of Wind Energy in State of Michigan



U.S. Wind Turbine Database

Database Release: January, 2019
Data Source: LBNL, USGS, AWEA
Map Interface: USGS, Energy Program

The USWTDB provides onshore & offshore wind turbine locations in the United States, corresponding facility information, and turbine technical specifications. Watch our tutorial video.

Showing 1,011 turbines on screen with a total rated capacity of 1,712 MW

When zoomed out, display turbine data as:
Density Heatmap ● Point Locations

Apply Range Filter to Turbines by:
● None ○ Height ○ Capacity ○ Year

☑ Exclude turbines with no data (0 here)

Low High

Apply Color Ramp To Turbines by:
○ None ○ Height ● Capacity ○ Year

<1 MW >3 MW

Zoom In To List Projects In this Area

Apple Blossom Project, MI
29 Turbines | Year Online: 2017
Total Rated Capacity: 100.0 MW
3.4 MW

Big Turtle Project, MI
10 Turbines | Year Online: 2014
2.0

Figure 1 illustrates where the majority of wind turbines are in the state of Michigan. Most wind turbines are located in the thumb of Michigan and in Gratiot County, an area encompassing Mount Pleasant, MI (United States Wind Turbine Database, 2019).

Literature Review

Extensive research has been conducted to help understand the complex social dynamics intertwined with the acceptance of wind energy technologies. 65% of individuals in the United States believe that energy companies should give priority to developing alternative energy resources, while only 27% believe that the U.S. should strictly focus on expanding fossil fuel resources (Kennedy, 2017); this documents the overwhelming national support for renewable energy technologies as replacements for fossil fuel drivers. However, acceptance of wind energy technologies varies from community to community, as some opponents to wind power argue that there is noise pollution, disrupted aesthetics, interference with local habitats, expensiveness associated with siting, and an overall unreliability for dependence on wind (Wolsink, 2000).

A 2017 research paper assessing public acceptance of wind energy technologies in North America by Rand and Hoen found many important influences on the public's opinions of wind energy. Among these important findings includes a conclusion that the Not-In-My-Backyard (NIMBY) mindset to oppose local wind projects is inherently invalid, the acceptance that these projects correlate directly with the socioeconomic impacts of the wind development, and factors such as trust, participation, and fair-mindedness are among the most important in obtaining local residents' support. In terms of influencing the environment, visual and sound impressions strongly correlate with opposition, and degradation of the surrounding environment can hinder progress towards siting a project (Rand & Hoen, 2017). These findings serve as an indication that there are many complex factors in play which, if acted upon in a poor manner, can reduce the ability for a wind project to be sited successfully.

To further comprehend the social dynamics surrounding wind energy sites, a case study by Jolivet and Heiskanen used the actor-network theory (ANT) to examine the nuances surrounding Cap Eole, a wind farm in the South of France. When the project started in 2002, about two-thirds of local residents supported it (Jolivet & Heiskanen, 2010). However, many issues were left without resolution—the most notable being the visual impact of the farm—causing a delay in its construction for up to eight years. Jolivet and Heiskanen concluded that the failure of this wind project was primarily due to two main aspects: framing and materialization. Framing is where information about the development strategy and corresponding stakeholders involved are shared with the public, while materialization is referred to as the gradual development of an idea until it 'materializes' into its final version (Jolivet & Heiskanen, 2010). The project manager of Cap Eole was open with the community about the environmental factors and financial incentives associated with the project, and the project manager even belonged to the local area where the turbine would be cited. He had plans to tie the project into the local context of the town by attaching the turbine to a larger tourism development project in the same area—Jolivet and Heiskanen believe this backfired on the project's success because the mayor also got involved due to the tremendous weight this project now carried. The mayor believed that the turbine would cause large-scale visible pollution, influencing tourists in the area who are sightseeing national monuments, buildings, etc. This suggests that having too many stakeholders involved in wind energy site placement could be detrimental to the success of the project by causing the initial framing to overflow to more stakeholders than needed. In regards to materialization, Jolivet and Heiskanen deemed that the developers of this wind turbine did not do their best to keep the community updated on the changing design of the wind turbine itself as it moved to its final stages of being constructed. Also, if the community itself sees the original image unfold to its ending stages of construction, Jolivet and Heiskanen offer that the public opinion will most likely change over the life cycle of the project (Jolivet & Heiskanen, 2010).

Using a wind farm pilot study, Catherine Gross explored the concept of fairness in communities' acceptance of wind energy farms (2007). The study was conducted in Australia, where Gross focused on a proposed wind farm of 69 turbines in the town of Taralga. Gross' primarily goal was to objectify the amount of fairness a project can provide, knowing that unjust or unfair projects can bring about divides in the community hindering proposed wind sites. The findings from this study indicate that people's various perceptions of fairness largely influence their attitudes towards the outcome, and if something is fairer it will be more likely to be accepted. Gross emphasizes that the concept of fairness is attributed to each community within a particular area differently and further explains that the three most important types of fairness are outcome fairness, outcome favorability, and process fairness. If a wind developer wants to ensure their project is as fair as possible, these three values must be considered in the context of a proper social framework (Gross, 2007).

These factors influencing social dynamics were selected as they are considered the most influential among the literature that is available. However, it is important to note that the factors presented in this literature review are not the only ones at play. Some developers have attempted solutions which include working with government agencies more in the wind turbine siting process and following more of an integrated approach to siting in an attempt to prove to the public that they are adequately trying to meet the public's requests towards the specific site (National Research Council, 2007). This means that attitudes towards wind energy sites are more complex than originally considered, and an analysis examining real-world examples of the opposition towards wind turbines will help investigate attitudes towards wind energy more in-depth.

Social Dynamics

The advancement of policies to promote wind energy technologies symbolizes environmental, technological, and economical progress in the realm of the renewable energy sector. There has been a sufficient rise in the popularity of wind energy over time; the technology to efficiently produce wind energy has maintained significant growth in market share and the prices of wind turbines are well below levels seen a decade ago (U.S. Department of Energy, 2017). About 6% of the total United States electricity generation was sourced from wind energy as of 2017 and 37% of electricity generation from renewable resources comes from wind energy (United States Energy Information Administration, 2018, "Electricity in the United States is produced with diverse energy sources and technologies"), highlighting the importance of wind energy in the current economy. Despite this significance, community opposition to deploying wind technologies does exist. For example, Cape Wind, an offshore wind project in Cape Cod, Massachusetts, was proposed by Cape Wind Associates, LLC in November 2001 (Bureau of Ocean Energy Management). The 468 MW project (Davidson, 2018), encouraged by Massachusetts' powerful renewable energy policies (Firestone, Hoen, & Rand, 2018), was ultimately struck down in December of 2017 as local communities filed multiple lawsuits over the course of 14 years (Firestone, Hoen, & Rand, 2018).

Onshore wind energy projects also face community opposition in the Midwest (McFetridge, 2018). A more recently proposed project during February of 2018 faced intense community opposition once the public was exposed to its suggested vicinity. This onshore project, titled the Freeborn Wind Farm, would add 100 turbines in Freeborn County, Minnesota; it also was expected to generate \$3.5-\$4 million for the local community (Lea, 2018). Affected landowners were given an opportunity to intervene with the proposed project and voice their concerns mainly with noise emitted by the wind turbines and any potential hazardous ecological impacts; this led to a decision that only 84 MW of the 200 MW could be built (State of Minnesota Office of Administrative Hearings, 2018). On May 14, 2018, the judge recommended denying a permit for Freeborn Wind Farm to be built and that they should better comply with Minnesota's Noise Standards (State of Minnesota Office of Administrative Hearings, 2018) if they hope for their project to be built in the future.

Wind energy projects in Michigan have also faced intense opposition in the past. Located in the thumb of Michigan between Saginaw Bay and Lake Huron, Huron County was identified as a region in the state with a high wind energy potential by The Clean, Renewable and Efficient Energy Act (PA 295) of 2008 (Groth & Vogt, 2014). Despite this sign of opportunity to grow wind energy in the thumb of Michigan, proposed wind energy projects in this area were met with differing perspectives. In 2010, residents of Huron County voted to pass a ballot proposal that would add another wind energy district to the area, with a little more than 40% of residents opposing this ballot (Editorial Board – The Bay City Times, 2010). However, in 2017, Huron County residents voted in opposition to two additionally proposed wind projects, demonstrating a decline of furthering support of wind energy in the county (Groth & Vogt, 2014). This symbolizes that attitudes towards wind projects can change drastically over time.

Another wind project facing heavy opposition located in Benzie County in northwest Lower Michigan was eventually struck down. This project was managed by Duke Energy and included a plan to implement dozens of turbines in the area. These residents took to political activism, where they campaigned against officials in support of bringing more wind energy to Benzie County. Some wind competitors even cited building helicopter pads, which have more than a mile radius in setback distance, as a way to stop the building of some wind turbines (Balaskovitz, 2015).

In the entire state of Michigan, there are more than 20 wind farms operating at full capacity and several more under development. The initial planning stages of wind projects could take up to 5 years, but the actual construction process takes 6-9 months, producing a turbine with an estimated life-span of at least 20 years (Jordan, 2017). Despite this relatively short time for construction and long operating life-span, most utility companies are shifting from creating new wind farms in Michigan to purchasing power in other midwestern states, such as Iowa (Carter, 2018). This reasoning is in part due to the public opposition faced in Huron County and the low wind speeds faced west of the thumb area of Michigan, which Consumer's Energy claimed in July of 2018. Although these companies are doing what is most economically justifiable and are technically still living up to their required standards, reports show that there is potential to produce more than 500,000 GWh of electricity from wind resources annually in Michigan alone (Matheny, 2015). Implementing wind energy projects within Michigan will also allow developers to better comply with the 15% renewable portfolio standard required in the state of

Michigan by 2021 (Carter, 2018). This is enough to create many jobs for Michigan's economy in the wind energy field and will play its part to mitigating the drastic effects of climate change in the future, justifying the need for understanding more of the complex attitudes towards wind energy projects.

To better understand opposition towards the adoption of wind energy, the topic of this thesis focuses on answering the following questions:

- Can the factors which resist wind energy development be predicted?
- What demographic factors influence a wind site to be contentious?
- Where are the locations in Michigan where wind opposition might be low but wind speeds are adequate to site a project?

To help answer these questions, this thesis will draw on past research completed by Dr. Sarah Mills, postdoctoral fellow at the Gerald R. Ford School of Public Policy, and Dr. Doug Bessette, Assistant Professor in the Department of Community Sustainability at Michigan State University. This work mainly builds off Mills and Bessette's (2018) study of how contentious wind projects in four Midwestern states (Illinois, Indiana, Michigan, and Minnesota) were. Their linear regression model was created isolating independent variables including demographic, agricultural, land use, and residential property characteristics coupled with a survey of wind development profession (Mills & Wentrack, 2018). To ground-truth this model to see if it yields accurate information, this thesis uses a mixed-method approach to study wind project proposals that are currently under discussion in the state. Contention is assessed using a content analysis of newspaper articles, and through conducting semi-structured interviews with energy company representatives from Michigan utility companies to better understand the social dynamics surrounding each site. Assuming that the social dynamics from these sources parallel the results of Mills and Bessette's linear regression model, this thesis will create a Geographic Information Systems (GIS) map to predict future areas in Michigan where wind opposition is likely to be low and wind speeds are adequate, helping to direct development to prospective sites that are both socially and economically viable. Overlaying these social acceptance and wind resource maps will allow policy makers to better identify bottlenecks to achieving clean energy policy goals.

Methods

Case Selection

This study focused on predicting levels of contention of proposed wind energy projects in seventeen different townships which are located in five different counties in the state of Michigan. These seventeen townships, also known as the cases for this study, were selected because they contain prospective wind energy projects being implemented simultaneously by a single developer (shown in Table 2). Multiple representatives of these wind projects confirmed that these areas do have cradle-to-grave development of wind projects in their regions.

Table 2 - Proposed Wind Energy Projects in Michigan

Project #1 – County A	**Project #2 – County B**	**Project #3 – County C & County D**	**Project #4 – County E**
Township A	Township E	Township K	Township O
Township B	Township F	Township L	Township P
Township C	Township G	Township M	Township Q
Township D	Township H	Township N	
	Township I		
	Township J		

*Table 2 describes the counties and townships affiliated with the four prospective wind energy projects that are being built by a wind developer in Michigan. *Note that Project #3 is located in both County C and County D which contains Township K, Township L, Township M, and Township N.*

Zoning Regulations

Each county or township possesses different zoning regulations which affect who has the ability to implement changes on a specified piece of land. This sometimes creates controversy around which entities can control the specific region of land and how they can alter it (Green & Sagrillo, 2005). The townships in this study ranged from already having zoning for wind energy in place to being completely unzoned.

Table 3 – State of Wind Energy Zoning Ordinances in 17 selected townships for Study

[Table 3 was removed to protect then anonymity of respondents].

Data Collection

In order to measure if Mills and Bessette's linear regression model could accurately predict contention among prospective wind energy sites in Michigan, data was collected in several ways. Following the strategy outlined by Giordono et al. to understand the social nuances of each township, local newspaper articles related to the selected townships were first compiled (Giordono et al., 2018). Then, a semi-structured focus group was held with wind energy developers who are knowledgeable about all of the wind projects chosen for this study. Contention, described as something that poses controversy or sparks debate (Dictionary.com), requires subjective assessment to be measured. For example, the newspaper articles and wind developers each have their own subjective perspectives of how contentious each township is in regards to wind energy projects being implemented in the area. In order to standardize contention across all methods, this study scored contention on a scale from 0 (least contentious) to 10 (most contentious).

The content of the local newspaper articles was assumed to be an accurate representation of the communities' reactions to wind projects in each township and is expected to match the wind energy developers' collective perspectives of what is occurring in these townships (Hypothesis 1). The results of the focus group of wind developers' collective perspectives were presumed to match Mills and Bessette's model (Hypothesis 2). The wind developers' perspectives are assumed to be the most accurate representations of reality, as these individuals understand the social dynamics of each project in depth since they are on the front lines in each of these communities; the newspaper reporters, on the other hand, only have a local perspective on a specific community. If Mills and Bessette's model does not match the perspectives of the wind energy developers in the focus group, Mills and Bessette's model must be revised to include variables that will more accurately predict how contentious proposed wind projects in Michigan are. The wind developers' qualitative suggestions of these new variables from the focus group are expected to improve the model to more accurately predict contention in the selected township for this study (Hypothesis 3).

Method 1: Evaluating Mills and Bessette's Model

Mills and Bessette's (under review) 2018 study examined existing wind projects in Illinois, Indiana, Michigan, and Minnesota to see if opposition to wind can be predicted using public data from the USDA Census of Agriculture, USDA Economic Research Service, U.S. Census American Community Surveys, and Townhall Presidential Election Data (Mills & Wentrack, 2018). Based on a comprehensive literature review, Mills and Bessette developed a linear regression model isolating different variables based on farmers, residential property characteristics, demographic factors, and land use characteristics resulting in place attachment (Mills & Wentrack, 2018). A survey was then sent to 69 different wind farms located across the selected four states; overall, there was a 41% response rate from a total of 46 respondents. The respondents were asked to rate the contention level of wind farms on a scale from 0 to 10, 0 being the least contentious value, 10 being the most contentious value, and 5 being neutral. Survey results are listed in Table 4 below:

Table 4 - Level of Contention: Mills and Bessette's Survey Statistics

Mean	2.88
Min	0.83
Max	7.67

Based on the results of the survey, seven independent variables were selected to be included in the final version of Mills and Bessette's Model to predict contention among existing wind projects, shown in Table 5 (Mills & Wentrack, 2018).

Results of Method 1: Evaluating Mills and Bessette's Model

Table 5 – Variable Estimates from Regression Analysis of Mills and Bessette's Original Model

Category	**Independent Variables**	**Coefficient**	**Std. Error**	**Significance (95% Confidence Interval)**
	Intercept	5.322	1.939	0.008
Agricultural	Principal operators not residing on farm operated (%)	-0.147	0.045	0.002
Agricultural	Size of farm	0.005	0.003	0.101
Agricultural	Population that worked at home (%)	-0.070	0.036	0.056
Demographic	Population that voted for Trump (%)	-0.066	0.028	0.021
Demographic	Population with a bachelor's degree or higher (%)	-0.049	0.034	0.156
Land Use	Natural amenity rank	1.539	0.399	0.000
Residential Property	Households with retirement income (%)	0.035	0.024	0.145
	[State = IL]	2.093	0.625	0.001
	[State = IN]	0.784	0.672	0.248
	[State = MI]	0.597	0.622	0.341
	[State = MN]	0^a		

a. This parameter is set to zero because it is redundant.

Table 5 demonstrates that Mills and Bessette's linear regression model was created isolating variables including demographic, agricultural, land use, and residential property characteristics coupled with a survey of wind development profession.

Only 7 variables were chosen when creating the linear regression model because this was based off of data from 69 wind farms. The most statistically significant variables (p-value < 0.05) were Principal operators not residing on farm operated (p-value = 0.002), Population that voted for Trump (p-value = 0.021), and natural amenity rank (p-value = 0.000). The independent variables that were selected for Mills and Bessette's linear regression model were combined with township level data available online for all of Michigan. The coefficient of 0.597 was the control for values in Michigan, which was added to the linear regression equation. A map of the predicted contention levels of each township was created in ArcGIS and is shown below in Figure 2.

Figure 2 shows the predicted values of contention from Mills and Bessette's model for each township in Michigan. Values closest to 0 signify almost no contention, while values closest to 10 signify extreme contention. A value of 5 represents a neutral area.

[Figure 2 was removed to protect then anonymity of respondents].

Mills and Bessette's model predicted that most of these townships range from values of contention from 2 to 6. The average value of contention across all townships in Michigan was 5.25, while the average value of contention across the 17 selected townships was 4.76. This implies that a majority of the 17 selected townships were close to neutral in how much contention wind projects caused each township. The least contentious township from this model was Township J in County B, while the most contentious township was Township H in County B.

Method 2: Content Analysis of Newspaper Articles

A content analysis of newspaper articles, where each newspaper was affiliated with one of the 17 different townships selected for this study, was coded for variables which signify contention and rated on a scale of contentiousness from 0 (least contentious) to 10 (most contentious), with 5 being neutral by the principal research investigators. Each article was coded using the NVivo 11 program. Ratings of contention were assigned by both members of the study team and were based on how many variables were coded per article and the overall tone of the article. The coding scheme used is listed below.

Table 6 – Coding Scheme used for Content Analysis of Newspaper Articles

Coding Scheme #	**Coding Scheme Explained**	**Coding Scheme Example**
1	People moved to area	"We picked this area because we wanted to live in a quiet, residential, farming-type of setting," she said.
2	People live for peace and quiet	Various speakers talked about living in Township M for the views, peacefulness and wildlife.
3	Farmers mentioned	Leases would help support farmers, who now need an extra job to support themselves.
4	Non-participants mentioned	The Commission did not want turbines to come close to those who did not sign leases – nonparticipants.
5	Vacation home-owners mentioned	N/A (none found in articles)

6	Retirees mentioned	"I'm retired, I can use the extra money. I don't mind looking at wind turbines."
7	Disruption to geology of local farmland	However, many are concerned that the wind turbines make too much noise, block out the sun, and ruin the areas farming landscape. (Moore, 2017).
8	Disruption to free property rights	“so we property owners have the right to use and enjoyment of our property free of nuisances.”
9	Property values will be lowered as a result of project being implemented	Residents said they're concerned the turbines could lower their property values.
10	Wind project affects quality of life in the community it would be built in	Another attendee of the event said some residents also have concerns about the wind turbines having a detrimental effect on their quality of life.
11	Local wildlife will be harmed by project	Opponents of wind turbines cite noise, flickering lights on each turbine and wildlife concerns, including the possibility of birds getting hit by the spinning turbine blades and dying.
12	Tractors are noisy	N/A (none found in articles)
13	Conflict of interest	Planning Commission Chairman said there is a hearing at Township G’s Hall to determine if a township board member's positions represent a conflict of interest. "They are saying it's a conflict of interest because he sits on two other boards that represent wind and energy,"
14	Influence of party politics	N/A (none found in articles)
15	Lack of zoning ordinances to blame	The anti-wind turbine organization created 16 months ago is most concerned about Township D which has no zoning
16	How populated area is (many people vs. not many people)	The wind farm project was proposed for a highly residential area of the township, which has a population of under 3,000, according to the U.S. Census.
17	Climate change is mentioned	N/A (none found in articles)

18	On a scale from 0-10 (0 indicating no contention and 10 being extremely contentious), how contentious is this article?	***This rating was assigned to each article by the principal research investigators.
19	Argumentative dialogue with 2 people shown	Even with a deputy in the room, the argument continued to elevate when one resident stood up and interrupted another woman. The two, who represent opposing sides in the wind turbine issue, began to raise their voices and argue.
20	Emotional trauma	At last week's board meeting, emotions erupted during public comment regarding procedures to contact township attorney
21	Offensive comments	Still standing, the man also responded in a very loud voice, "You're saying one side of the residents don't matter, but the other side is perfectly fine. If you're on the other side, we're just dirt and we don't matter. You just told me to leave when I stood up. You gave her the time of the day when she stood up."
22	Threats	"The other side is not willing to listen and the trustees are running very scared, they've been threatened with recall."
23	Two opposing views are given in same article	Inviting a wind farm into the town would help increase city and county revenues. Local farmers with enough land who sign a participation agreement for a proposed project could receive thousands of dollars a year for allowing wind developers to use their land. However, many are concerned that the wind turbines make too much noise, block out the sun, and ruin the areas farming landscape.
24	Project is referred to as "fair" in appropriate context	N/A (none found in articles)
25	Project is referred to as "unfair" in appropriate context	A representative from Township A said their citizen group is getting no help from the Township D Board on the wind turbine issue .

Table 6 describes the coding scheme used to assign a value of contention for each local newspaper article found online.

Overall, 56 different newspaper articles (N = 56) were selected for the content analysis. It is important to note that newspaper articles which only discussed wind turbine issues at the county level were not considered in this study; only newspaper articles with issues directly related to the 17 selected townships were considered. Articles that were editorials were disregarded, in addition to social media posts and any articles including the principal investigators themselves. Some articles were coded twice, each code responding to multiple different townships mentioned in the article. The following was entered into a search engine to find the articles used for this study: *Township Name, Michigan, Wind.* To see the results of how each township was rated along with how often each code occurred in the content analysis, refer to Appendix 1A and 1B. The averages of the individual ratings of contention assigned to each township can be seen in Table 7.

Results of Method 2: Content Analysis of Newspaper Articles

Each article corresponding to the selected townships used in this study was coded for a level of contention on a scale from 0 (least contentious) to 10 (most contentious). The total number of articles for each township was observed; then, the average contention score across all articles affiliated with a township was determined. The overall results of the average contention ratings and rankings of the 17 selected townships are shown in Table 7.

Table 7 - Results of Individual Ratings of Contention of Newspaper Articles

Township	**Number of Articles**	**Average Contention Score**	**Rank (from least contentious to most)**
B	4	7	11
A	4	5.25	4
D	7	5.71	6
C	N/A	N/A	N/A
M	7	6.44	9
K	1	6	8
N	N/A	N/A	N/A
L	3	4.67	2
G	14	5.86	7
E	1	5	3
F	7	4.29	1
J	N/A	N/A	N/A
H	N/A	N/A	N/A
I	3	5.33	5
P	N/A	N/A	N/A
O	1	6	8
Q	4	6.5	10

Table 7 shows how the average contention score for each township rank amongst each other. The results of this methodology demonstrate that Township B is the most contentious township selected for this study, while Township F is the least contentious township selected for this study.

Some townships do not have ratings, as there were no available articles found online for these townships.

Method 3: Focus Group Exercises

A semi-structured focus group with wind developers who are knowledgeable about the proposed wind projects in the 17 selected townships for this study was conducted on July 1st, 2019 at 1:30 PM in Room 2120 of the University of Michigan's Gerald R. Ford School of Public Policy. The focus group lasted for about 2 hours, and a total of 9 individuals were present: 6 wind developers who were the research participants, and 3 principal investigators (Dr. Sarah Mills, Dr. Doug Bessette, and research student Mayur Bandekar). The research participants were asked to complete a consent form which presented the risks, privacy statements, confidentiality agreements, and notice of audio recording. All participants signed the consent form successfully.

At the beginning of the focus group, developers were asked the following demographic questions to help stimulate conversation:

a. What is your name?
b. What is your general relationship to proposed projects that are proposed in County A, County B, County E, or County C & D?

Activity #1 - Individual Ratings of Selected Townships

Anonymously, each developer was asked to individually rate the level of contentiousness from 0 (least contentious) to 10 (most contentious) in the 17 selected townships where wind energy is under discussion in the community prior to construction of the wind farm. Although some developers were familiar with particular townships more than others, each answered to the best of their ability, even if they did not have any direct experience in the community. If the developer did not know enough about a project to make an assessment, they left that answer choice blank. The results of Activity #1 are shown in Appendix 2.

Activity #2 - Collaborative Sticky-Note Rating Exercise

Developers were asked to rate the level of contentiousness from 0 (least contentious) to 10 (most contentious) of the 17 selected townships collaboratively. A scale from 0-10 was drawn on a chalkboard, and the developers placed a sticky-note with each township's name on the scale where they believed the contention level was. Each sticky-note was color-coded according to the following key: Purple Sticky-notes = County A, Teal Sticky-notes = County C and County D, Yellow Sticky-notes = County B, and Light Blue Sticky-notes = County E.

Open group discussion among all developers before each township was rated on the chalkboard was highly encouraged. Once all townships were rated on the chalkboard successfully, several questions were asked as to why certain townships were rated lower than others. During the focus group, suggestions were made by the wind developers as for what variables to include in the future model; these factors are discussed and enumerated in the results.

Results of Method 3: Focus Group Exercises

The contention scores rated by the focus group of wind developers are recorded below.

Table 8 - Results of Focus Group Collaborative Sticky-Note Rating Exercise

Township	**Contention Score**	**Rank (from least contentious to most)**
B	9	14
A	6	7
D	2	2
C	1	1
M	8	12
K	3	4
N	2	2
L	3	4
G	10	16
E	7	10
F	10	16
J	6	7
H	6	7
I	9	14
P	4	6
O	7	10
Q	8	12

Table 8 illustrates how each wind developer rated the contention level of each township selected for this study. Township C was found to be the least contentious, while Township G and Township F were the most contentious.

Comparing the Results of Individual Ratings of Contention from Newspaper Articles to Rankings of Contention Scores from Focus Group Collaborative Sticky-Note Rating Exercise

Assuming that the ratings of contention given by the developers for the sticky-note rating exercise are the most accurate indicators of contention, these results were compared to the individual ratings of contention given for the newspaper articles selected for each township. A linear regression analysis was used to compare the results of these two methodologies and is shown in Figure 3 below.

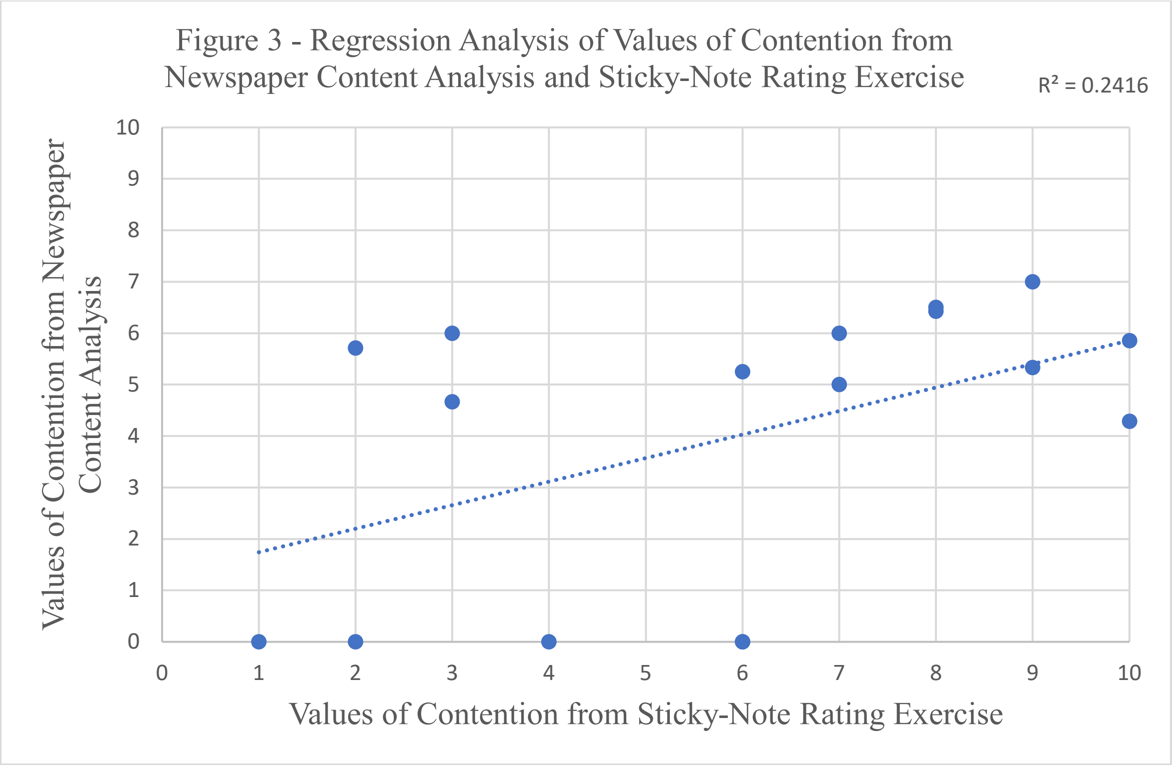


Figure 3 indicates a weak relationship between both the values of contention from the sticky-note rating exercise and the values of contention from the newspaper content analysis.

From Figure 3, it can be noted that the R^2 value of 0.2416 indicates there is a weak correlation between variables. In practical terms, this means that the content found in the local newspaper articles does not reflect the wind developers' perceptions from the focus group. The values of 0 from the newspaper content analysis represent no news articles found for four different townships. These values were still included in this analysis because having no news reported from a specific township also implies that there is little or no contention occurring in the area; no news, in a sense, corresponds to good news. This is an indication that the newspapers only reflect contention happening locally at the township that they are associated with, whereas the developers' perceptions reflect contention levels across all townships. This is the main reason why the wind developers' views of how contentious these townships are treated as close to objective reality as possible in this study.

Comparing Mills and Bessette's Model to Rankings of Contention Scores from Focus Group Collaborative Sticky-Note Rating Exercise

The results of the collaborative sticky-note rating exercise were compared to the results of Mills and Bessette's model and were presumed to match Mills and Bessette's model (Hypothesis 2). The results of this comparison are shown below in Figure 4.

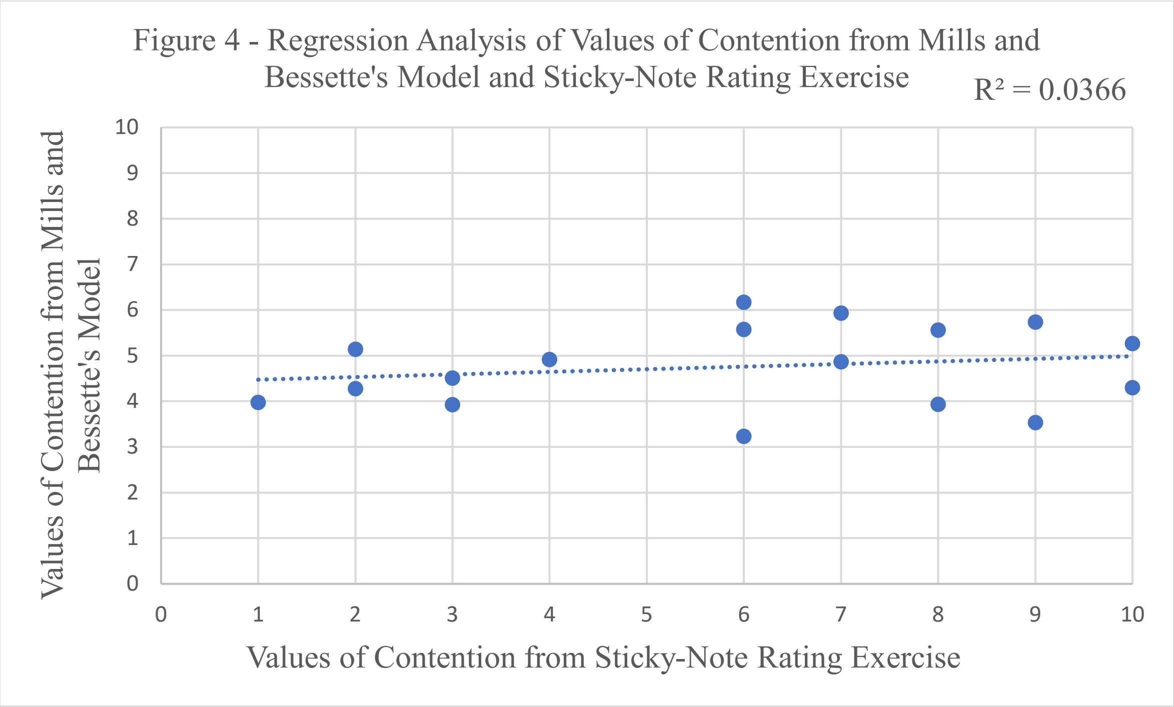


Figure 4 indicates a weak relationship between both the values of contention from the sticky-note rating exercise and the values of contention from Mills and Bessette's Model.

The R^2 value of 0.0366 has a positive correlation, meaning that the values from the model and sticky-note rating exercise move in the same direction. However, this is R^2 value is still a small number, signifying an extremely weak correlation in this model. The results of this analysis indicate that Mills and Bessette's original model needs to be revised if it is to be a more accurate predictor of contention. During the focus group, comments were made by the wind developers as suggestions for what variables to include in the future model. These comments effectively serve as anecdotes for why the wind developers think that wind development is more contentious in some of the 17 townships compared to others.

Method 4: Revising Mills and Bessette's Original Model

The results demonstrate that the values of contention obtained from the semi-structured focus group exercises were different than what the model predicted the values of contention for these proposed wind projects were. This suggests that Mills and Bessette's model must be reassessed to include the necessary variables that will more accurately predict values of contention when examining proposed wind projects in Michigan. During the focus group, suggestions were made by the wind developers for what factors to include in the revised model, which are described below.

One of the factors suggested by wind developers to include into Mills and Bessette's model was religiosity of the community. In the wind developers' experiences, there are a select few people that were driving forces behind the opposition to many of their proposed wind projects. These individuals, according to the developers, had tremendous faith and belief that the wind projects did not deserve to belong in their community, representing a vastly influential presence in the opposition movement. The wind developers mentioned that it is not which particular type of religion that one follows, or whether the fact that one is religious; it is the idea that someone has immense faith in anything which can be a catalyst to forming strong community opposition groups that is best measured by religiosity.

Another factor suggested by wind developers to include in the new model can be described as proximity to a lake community. The reasoning behind this suggestion was that those that live in a lake community would be upset that there would be negative effects to their own lake property if there was a wind turbine present in their community, resulting in an overall contentious community. An added explanation was that the people in these lake communities are closer with each other and tend to communicate with each other often, meaning that opposition groups would be more likely to form. Two of the townships mentioned which can be labeled as lake communities according to the wind developers are Township B and Township A.

The last factor that was suggested to be included in the revised version of Mills and Bessette's model is whether the area is a bedroom community. Bedroom communities can be defined as residential areas where a large amount of individuals live but do not work; instead, they work in a neighboring town, and the own town where they live in is used as a commuter town (Preston, 2013). The wind developers proposed that areas that are considered more of a bedroom community are more likely to be contentious since bedroom communities provide an environment that is away from residential life. As a result, more individuals who live in these bedroom communities are opposed to wind projects being built in their community because they believe that wind projects would disrupt the "natural" and "peaceful" communities they live in. Examples that were given of bedroom communities were Township G and Township M.

Adding Factors into Mills and Bessette's Original Model

Religiosity data for all available counties in the United States was found from the U.S. Religion Census 1952 to 2020 (U.S. Religion Census 1952 to 2020, 2010). This data, taken from the most recent year 2010, contained many different variables describing the religious communities in the United States; however, only the Adherents % data for each county was used as a representation of religiosity in this study.

Proximity to a lake community was measured by calculating the total area of lakes and ponds in square meters within the townships selected for this study. The data for this factor was taken from the file "USA Detailed Water Bodies" located on the ArcGIS Hub website (Esri, 2018). The larger the total area of lakes and ponds, the more likely the township is considered a lake community.

The bedroom community data was harnessed from the Longitudinal Employer Household Dynamics (LEHD) 2015 dataset, where residence area characteristics: all jobs by age (total number of workers) and workplace area characteristics: all jobs by age from all census tracts (total number of jobs) from the United States were downloaded (U.S. Census Bureau, 2015). The residents to job ratio was calculated by dividing the residence area characteristics: all jobs by age by the workplace area characteristics: all jobs by age. This ratio is an indicator of the extent to how much of an area can be determined to be a bedroom community – the higher the ratio, the more the area is considered a bedroom community.

Results of Method 4: Revising Mills and Bessette's Original Model

Again, only 7 variables were selected when creating the linear regression model because this model was based off of data from 69 wind farms. The three factors suggested by the wind developers—adherents (%), sum of lake and ponds area (square meters), and residents to jobs ratio—were included. The other four variables were selected based on if they were statistically significant in the original model or if they were available at the sub-county level. Both natural amenity rank and principal operators not residing on farm operated (%) were statistically significant variables in the old model, while the population that worked at home (%) and population with a bachelor's degree or higher (%) were available at the sub-county level (Table 5).

Table 9 – Variable Estimates from Regression Analysis of Mills and Bessette's Revised Model

Category	**Independent Variables**	**Coefficient**	**Std. Error**	**Significance (95% Confidence Interval)**
	Intercept	0.474	1.545	0.760
Suggested Factor	Sum of lakes and ponds area (square meters)	1.199E-09	4.110E-08	0.977
Suggested Factor	Residents to jobs ratio	0.073	0.122	0.554
Suggested Factor	Adherents (%)	0.068	0.021	0.003
Land Use	Natural amenity rank	1.241	0.335	0.000
Agricultural	Population that worked at home (%)	-0.062	0.036	0.094
Agricultural	Principal operators not residing on farm operated (%)	-0.208	0.041	0.000
Demographic	Population with a bachelor's degree or higher (%)	-0.049	0.035	0.159
	[State = IL]	5.119	1.016	0.000
	[State = IN]	2.238	0.738	0.004
	[State = MI]	2.213	0.752	0.005
	[State = MN]	0[a]		

a. This parameter is set to zero because it is redundant.

Table 9 demonstrates the revised version of Mills and Bessette's linear regression model, which was creating using different variables as an effort to more accurately predict the contention values of the selected townships for this study.

The most statistically significant variables in the revised model's parameter estimates (p-value < 0.05) were principal operators not residing on farm operated (p-value = 0.000), natural amenity rank (p-value = 0.000), and adherence (p-value = 0.003). The control for values in Michigan, 2.213, was added to the linear regression equation. Comparing the variable estimates in the regression analyses found in Table 5 and Table 9, the same negatively correlated independent variables found in the original model's variable estimates (Principal operators not residing on farm operated (%), Population that worked at home (%), Population with a bachelor's degree or higher (%)) are also negatively correlated in the revised model's estimates. This means that as these variables increase, they result in lower contention scores. The fact that Adherents (%) was significant as shown in Table 9 is interesting, as this data was only available at the county level and would not have a significant effect on differences of ratings of contention between townships. A map created in ArcGIS of the predicted contention levels of each township using the revised model is shown below in Figure 5.

Figure 5 shows the predicted values of contention from the revised Mills and Bessette's model for each township in Michigan. Values closest to 0 signify almost no contention, while values closest to 10 signify extreme contention. A value of 5 represents a neutral area.

[Figure 5 was removed to protect then anonymity of respondents].

When comparing the differences of predicted contention values from all townships in Michigan between the original Mills and Bessette's model (Figure 2) and the revised Mills and Bessette's model (Figure 5), the average difference observed was 0.78. The minimum difference of -4.61 pertained to Marenisco Township in Gogebic County, while the maximum difference was 3.88 which pertained to Wakefield City in Gogebic County. The specific differences between contention values of the 17 selected townships in this study is shown in Appendix 3.

Comparing Revised Mills and Bessette's Model to Rankings of Contention Scores from Focus Group Collaborative Sticky-Note Rating Exercise

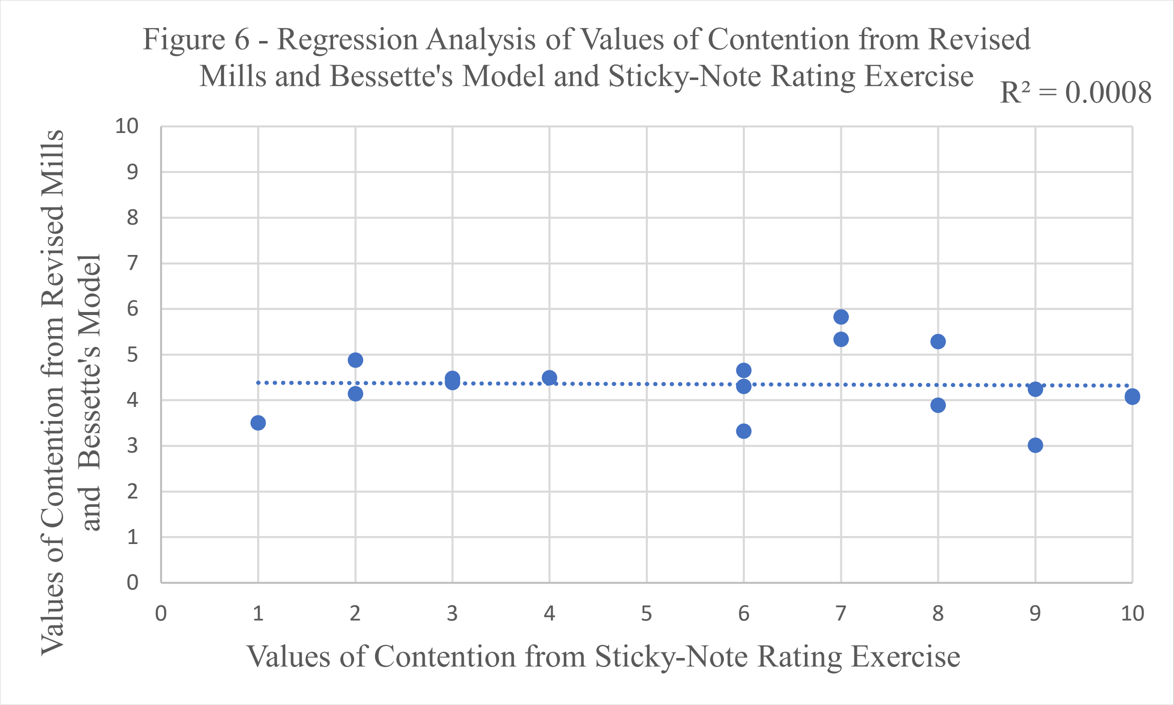


Figure 6 indicates a weak relationship between both the values of contention from the sticky-note rating exercise and the values of contention from the Revised Mills and Bessette's Model.

The R^2 value of 0.0008 signifies a weak relationship as seen in Figure 6. This implies that the revised version of Mills and Bessette's Model was not good at predicting how contentious each township is. This nuance is further evaluated in the discussion section below.

Discussion

From the results of the newspaper content analysis, it can be determined that the newspapers did not accurately reflect the level of contention that each township faces as defined by the wind developers. This can be seen in Figure 3, which notes the weak relationship between the values of contention from the sticky-note rating exercise and the values of contention from the newspaper content analysis. Hypothesis 1, which predicted that the content of the newspaper articles would match the wind developers' collective perspectives of the levels of contention in each township, is therefore invalid. For most academic research in the social science discipline, using newspaper articles as credible and accurate sources is a norm, as newspapers often contain unique information that is not captured anywhere else (Tanacković, Krtalić, & Lacović, 2014). This study shows that newspapers articles do not entirely parallel levels of contention from the model, suggesting that the use of newspapers in academic research is insufficient and should be considered carefully. An important point to note is that the local newspapers are looking at contention within their own township, while the wind developers have knowledge of contention in all townships and can make a more distinctive prediction of contention. This also suggests that the media is not portraying the community opposition to wind turbines in each township as clearly as possible, since there is a bias with how each reporter writes about the contention that occurs in their township. This bias may be minimized by having one reporter visit each township and write about all of the prospective wind projects being built by the same developer simultaneously.

Another finding from this study was that the wind developers' collective perspectives did not match Mills and Bessette's original model, indicating that Hypothesis 2 is invalid. Referring to Figure 4, a weak relationship was observed when comparing the values of contention for the selected townships between Mills and Bessette's original model and the wind developers' collective perspectives. In fact, Mills and Bessette's model was worse at predicting contention compared to the newspaper content analysis ($R^2 = 0.0366$ vs. $R^2 = 0.2416$). This provided enough reason for the original model to be tweaked, including possible factors that would be more likely to give an accurate prediction of contention.

Adding the factors (proximity to a lake community, residents to jobs ratio, and religiosity) suggested by the wind developers was hypothesized (Hypothesis 3) to improve the model to more accurately predict contention but ended up producing less accurate results than the original model predicted. Comparing Figure 2 and Figure 5, most of the selected townships stay the same color, as their contention ratings fall within the same range as the original model predicted. Two townships, Township H and Township K, do change colors to correspond to a different range, but Township K does not represent a large difference across all townships. Appendix 3 shows that the largest changes between contention scores from the original model to the revised model are seen in Township H, Township I, and Township A.

During the focus group, two examples of townships that were more likely to be considered bedroom communities by the wind developers were mentioned: Township G and Township M. The residents to jobs ratios for Township G and Township M were 0.8358 and 2.5780, respectively. Both of these values are relatively low when compared to the average residents to jobs ratio across the 17 selected townships, 4.2583. This suggests that either the developers' perceptions of whether these townships can be considered more of a bedroom community than other townships are flawed, or that the method used to measure how much of an area is considered a bedroom community could be better improved. In fact, there was no significant correlation between a higher residents to jobs ratio (more likely to be a bedroom community) and the revised model's prediction of contention ratings across all selected townships.

Two examples of areas that are described as "lake communities" were mentioned during the focus group: Township B and Township A. The sum of lake areas and ponds in Township B is 1,233,310 square meters, while the sum of lake areas and ponds in Township A is 83,990.3 square meters. These are the largest lakes and ponds located in all of the townships, validating the claim the developers made that these townships are more likely to be lake communities. There appears to be no trend when examining if larger lake areas and ponds in townships correspond with higher contention scores, as Township B has the largest sum of lake areas and ponds contained within its boundaries but has the lowest contention score across all 17 townships according to Mills and Bessette's revised model.

The factors which resist wind energy development can be predicted, but not reliably. It is even more complex to isolate which factors influence a wind site to be more contentious than another, as there were no significant trends among variables indicating contention and their resulting contention scores. The revised version of Mills and Bessette's model resulted in a less accurate prediction of contention for each township. As a result, a GIS map overlaying the areas in Michigan with adequate wind speeds and low contention scores was not created.

As this project tried to accurately predict contention as best as possible, several limitations existed that hindered the accuracy of these results. For the newspaper content analysis, a bias existed since the principle researcher was subjectively assigning a contention score to each of the newspaper articles found. To combat this, the researcher assigned a score of contention according to the overall content indicating contention coded throughout each article. However, there was no objective methodology surrounding this, meaning that a specific number or type of variable coded in each article did not achieve a certain score of contention.

Bias in wind developers' perceptions was another limitation faced in this study. Some developers had better ideas of how contentious some townships were compared to others based on past experiences and roles within managing projects in these areas. In order to minimize this bias, the sticky-note exercise was completed collaboratively, assuming that those that had the most knowledge of the social dynamics in each area would have a stronger opinion and a group consensus agreed upon this measure. Of course, using developers' perceptions, which are entirely subjective data points, will not be 100% credible or accurate; however, this is the best known way to obtain as close to possible accurate representations of the social dynamics underlying the selected townships in this study.

An additional limitation faced in this study was that some of the datasets that were obtained from online sources were only available at the county level, not at the township level. For example, religiosity data was only available for each county, meaning that measuring a difference of religiosity between the 17 selected townships for this study could not be accomplished. However, according to Table 9, this variable was still significant in the revised model. If this study was comparing the overall contention of counties where these wind projects are located in, it is possible that there would be significant differences between the contention levels of counties and indicate where more contentious areas are likely to be located.

The 7 variables included in both Mills and Bessette's original model and Mills and Bessette's revised model were different, indicating a bias in how the contention values were produced. Some variables were common to each model, such as natural amenity rank, population that worked at home (%), principal operators not residing on farm operated (%), and population with a bachelor's degree or higher (%).

The last major limitation was that the wind developer stated that there are factors in community opposition that are extremely hard to account for—one of these was measuring the impact of a social media premise. This study did not account for posts or interactions on social media, although many community opposition groups do interact using this medium to air their complaints publicly (Mayfield III, 2011). Creating a method of measuring social media influence and including this method in Mills and Bessette's model will likely predict contention in a more accurate manner.

Conclusion

The purpose of this study was to assess if the factors which resist wind energy development can be accurately predicted and if certain factors would be more likely to influence how contentious a wind energy site would be. Mills and Bessette's original model did not accurately match the wind developers' perceptions of how contentious 17 Michigan townships which harbor prospective wind energy projects were. In fact, Mills and Bessette's model was worse at predicting contention in these townships than the newspaper content analysis, although the newspaper content analysis also did not predict contention in these townships very accurately. This suggested that Mills and Bessette's model be tweaked and that the use of newspapers as credible sources in academic research be reconsidered. After identifying a few factors that would be more likely to accurately predict contention according to wind developers knowledgeable about the selected projects for this study, these factors were included in Mills and Bessette's revised model but resulted in less accurate predictions of each selected townships' level of contention. Because these methods produced unsuccessful results, creation of a GIS map overlaying adequate wind speeds and low wind opposition was not warranted.

Overall, this study found that it is difficult to identify and measure the influence of variables which are plausible indicators of contention and that assessing the social dynamics surrounding wind energy sites is more complex than it appears. To combat these difficulties, it is recommended that more objective data to understand community attitudes towards wind energy sites, such as conducting face-to-face interviews with wind opposition groups, be obtained in the future. Another recommendation is to have neutral observers attend public hearings in the communities where these wind energy projects are being debated in. Finally, it is recommended that more data be obtained at the township level, which will help produce more accurate predicted values of contention when comparing contention levels between townships. This research has further implications in terms of finding more efficient methods for wind energy developers to assess how contentious a prospective wind site is in order to successfully site wind projects to meet their clean energy policy goals.

Appendix 1A – Results of Newspaper Content Analysis: Number of Times Coding Scheme Occurred in Content Analysis

Coding Scheme #	Coding Scheme Explained	Number of Times Code occurred across all townships
1	People moved to area	4
2	People live for peace and quiet	5
3	Farmers mentioned	11
4	Non-participants mentioned	5
5	Vacation home-owners mentioned	0
6	Retirees mentioned	1
7	Disruption to geology of local farmland	6
8	Disruption to free property rights	6
9	Property values will be lowered as a result of project being implemented	14
10	Wind project affects quality of life in the community it would be built in	4
11	Local wildlife will be harmed by project	8
12	Tractors are noisy	0
13	Conflict of interest	13
14	Influence of party politics	0
15	Lack of zoning ordinances to blame	6
16	How populated area is (many people vs. not many people)	4

17	Climate change is mentioned	0
18	On a scale from 0-10 (0 being no contention and 10 being extremely contentious), how contentious is this article?	
19	Argumentative dialogue with 2 people shown	3
20	Emotional trauma	13
21	Offensive comments	3
22	Threats	4
23	Two opposing views are given in same article	23
24	Project is referred to as "fair" in appropriate context	0
25	Project is referred to as "unfair" in appropriate context	1

Appendix 1B – Results of Newspaper Content Analysis: Total Number of Codes Occurring in each Township

Township Name	Total # of Codes per Township
B	16
A	10
D	14
C	0
M	30
K	3
N	0
L	8
G	32
E	2
F	10
J	0
H	0
I	4
P	0
O	1
Q	4

Appendix 2 - Average Rankings and Ratings of each township across Wind Developers (Individual Exercise #1)

Township Name	Rating	Ranking
B	7.33	12
A	5.8	8
D	3.67	4
C	4.4	5
M	8.2	14
K	2.8	2
N	2.4	1
L	3.25	3
G	9.2	16
E	7.25	11
F	9.4	17
J	6.67	10
H	6	9
I	8.8	15
P	4.5	6
O	5.25	7
Q	8	13

Appendix 3 - Ratings of Contention from Mills and Bessette's Original Model and Mills and Bessette's Revised Model

Township Name	Values of Contention from Mills and Bessette's Model	Values of Contention from Revised Mills and Bessette's Model	Difference between Contention Values (Original Model – Revised Model)
B	3.53	3.02	0.51
A	5.57	4.30	1.27
D	5.14	4.15	0.99
C	3.98	3.51	0.47
M	3.94	3.89	0.05
K	3.92	4.48	-0.56
N	4.28	4.88	-0.6
L	4.51	4.39	0.12
G	5.27	4.09	1.18
E	4.87	5.33	-0.46
F	4.30	4.07	0.23
J	3.23	3.32	-0.09
H	6.17	4.65	1.52
I	5.73	4.24	1.49
P	4.92	4.49	0.43
O	5.93	5.83	0.1
Q	5.56	5.29	0.27

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