# WIND FARM DEVELOPMENT: AN ANALYSIS OF FACTORS INFLUENCING RESIDENTS' PERCEPTIONS OF WIND TURBINES

By

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#### ABSTRACT

## WIND FARM DEVELOPMENT: AN ANALYSIS OF FACTORS INFLUENCING RESIDENTS' PERCEPTIONS OF WIND TURBINES

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Assisting communities adjust to change is crucial in ensuring that successful, vibrant communities continue to flourish. Recent studies have suggested that a lack of community involvement in planning stages, uncertainty regarding proposals, place attachment and NIMBY (Not-In-My-Backyard) are some factors used to explain resistance to wind development (Jones & Eiser, 2009; 2010; Swofford & Slattery, 2010). This research studies perceptions and support levels held by residents in four townships of Huron County, MI of wind farm development. The aim of this study was to determine whether proximity to a wind turbine, ownership of land, and knowledge of wind energy influenced perceptions of and support of wind farm development. Social exchange theory aided in the interpretation of the research results. Social, economic and environmental belief factors were tested to evaluate their role in shaping perceptions and support. Data were collected using the mixed methods of interviews of stakeholders and mail surveys to landowners (n=497 respondents, 50% response rate). The results suggested proximity, amount of land owned, and self-rated knowledge of wind energy were not related to perceptions of or support for wind farm development. Social beliefs about positive outcomes were strongly related to perceptions of wind farm development, followed by economic beliefs about outcomes of wind farm development. Respondents who were neutral in their opinions before development tended to perceive wind farms negatively after construction. Social and environmental beliefs about positive outcomes of wind turbines were strongly related to support for wind farm development, yet concerns regarding impact on the environment, economy and people existed.

For everyone who believed in me.

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### Chapter 1

### Introduction

A global effort to combat climate change is underway. The United States government is advocating for more renewable energy to replace the reliance on foreign oil. In an effort to reduce the amount of ozone degrading pollutants expelled into the air, the newly created American Recovery and Reinvestment Act of 2009 set a standard to double the renewable energy production in the United States by 2012. The state of Michigan enforces Public Act 295, better known as The Clean, Renewable and Efficient Energy Act, requiring Michigan electric providers to derive at least ten percent of retail supply from renewable energy sources by 2015 (Commission, 2005). As a result, energy providers are securing leases from private landowners to erect wind turbines in order to meet their renewable energy goals. Wind developers are increasingly focused on rural areas for future and continued development as land is less expensive compared to more developed regions. Rural communities in Michigan have been struggling economically, and have the opportunity to reposition themselves with this new development that uses minimal land areas and utilizes air-based resources. The erection of a wind turbine on agricultural land allows a farmer to continue farming around the turbine base while the income from housing a turbine exceeds the amount of revenue lost from decreased crop production (Development, 2007).

To facilitate wind developments, The Clean, Renewable and Efficient Energy Act (PA 295) of 2008 created a Wind Energy Resource Zone board to identify regions in the state with the highest wind potential. Referencing wind energy maps created in 2004, the board identified the Thumb region of Michigan as having the highest potential, and it was declared the state's primary wind resource zone (Birkholz et al., 2008). Wind developers initially contacted only landowners with large tracts of land to secure leases to build turbines upon. Those who agreed to

participate, signed a non-disclosure agreement prohibiting landowners from discussing their deal, received a signing bonus and were promised additional income if a turbine was built upon their property in the future. Some residents were shocked to learn that wind farms were being introduced into their area and they had no idea anything was being planned. Two wind farms were consequently constructed. A 46 turbine, 69 megawatt wind farm near Ubly (Bingham Township) and a 32 turbine, 52.8 megawatt wind farm near Elkton/Pigeon (Oliver Township) in Michigan both of which went online in 2008 (Nordman, 2009a). In the years since, "lawsuits were filed, heated discussions swirled in packed public hearings and work on future developments continued, as did dissent between wind energy proponents and opponents" (Hessling, 2010). In 2010, two new wind districts were proposed in Huron County and a petition was filed to put this decision on a ballot to confirm the creation of the districts. Proponents said "future wind developments will bring jobs, increase local tax revenue and help the environment" while opponents declared that "the proposals will open the door to thousands [of] turbines in the Thumb, and future developments will cause health problems, increase utility prices, lower property values and harm aesthetic value of Huron County" (Hessling, 2010). Those voters residing in townships under County zoning (50% or 14 out of the 28 townships in the County) were allowed to vote on the proposals and each proposal passed by more than 600 votes across the voting townships.

Huron County is recognized for agriculture and with nearly 1,200 farms with 430,000 acres of land being devoted to farming, wind energy development was suited for Huron County (Commission, 2005). A review of the Huron County Master Plan Amendment (Commission, 2005), might suggest that the authors may have overlooked some factors that are important in successful construction and operation of wind farms. This document was adopted by the Huron County Board of Commissioners in July 2005. The list of 'limiting factors' in the

Agricultural Preservation/Alternate Energy Resource Overlay strategy included tree cover areas, wetland areas, shoreline areas and proximity to airports. The limiting factors were physical in nature and did not list any 'human' or social exclusions (i.e. schools, hospitals or churches). The public's perception or general attitude/acceptance toward wind energy generation was not listed as a potential limiting factor. It would seem as if the Planning Commissioners presumed that the residents in Huron County would just follow along with their recommendation to approve wind energy generation in an effort to slow development and preserve prime agricultural lands. While benefits exist, this alone does not ensure the success of wind development in rural areas.

## Statement of the Problem

The focus of the research was on the factors influencing residents' perceptions of wind energy development. Specifically, the study sought to answer the following research questions:

- 1. Does an inverse relationship exist between the proximity of a residence to a wind farm and positive perceptions of wind development among residents?
- 2. Does the level of attendance of wind zoning meetings in the planning process of wind farms influence the support for wind farm development among residents?
- 3. Does the amount of land owned affect perception and support of wind farm development among residents?
- 4. What belief factor outcomes contribute to perceptions of wind farm development among residents?

The social exchange theory was utilized to frame study and explain results. To answer these questions, a geographic location was studied that included four townships in a county with zoning for selected wind turbine siting: two rural townships with wind farms and two rural townships without wind farms.

#### Purpose Statement

If wind farms are to be a prominent source of renewable energy and economic growth in Michigan, residents' perceptions should be understood to the same extent as turbine siting setbacks and allowable decibel levels. This research will provide communities with a framework to acknowledge perceptions that may exist in rural communities and efforts that may aid in successful incorporation of constructing wind farms.

## Significance of the Study

In general, public support for onshore wind development is high (Jones & Eiser, 2009; 2010; Swofford & Slattery, 2010). Researchers, however, are addressing the fact that "despite high levels of public support for onshore wind development in principle, specific projects often experience local opposition" (i.e. social gap) (Jones & Eiser, 2009, p. 4610). Research in this area has found that the over-used term of NIMBY (Not-In-My-Backyard) is generally not applicable as the dominant and only reason that local opposition exists. NIMBYism alone cannot describe the general acceptance of wind energy in the face of local opposition. Recent studies have suggested that lack of community involvement in the planning stages, uncertainty regarding the proposals, and place attachment are just some factors that continually become apparent in resistance of wind energy development (Jones & Eiser, 2009; 2010; Swofford & Slattery, 2010).

With the growing interest and enthusiasm expressed by the state and national government on renewable energy and the lack of concrete evidence as to what influences residents' perception of wind energy development, an in depth analysis of wind farm development was thought to be necessary. The need for a more thorough understanding of the hierarchy of factors influencing perception is essential for further successful construction of wind farms. In the

present study, an effort was made to make generalizations regarding residents' perceptions in selected townships in Huron County, Michigan in hope that they could assist wind developers and local decision makers in formulating standards that would consider residents' perceptions. This study will be helpful to the communities directly involved, as well as other rural communities who are facing a similar decision about wind farm development. In addition, this research will inform current efforts by community developers to improve the communication of specific practices of sustainable development to local residents.

## Delimitations

The study was delimited to the following:

- The focus was on small (population < 3,500) communities with heavy reliance on agriculture production and recent (2008) wind farm development or future wind farm development, thus this researcher profiles early stages of development.
- Eleven semi-structured interviews and two scientific studies (Jones & Eiser, 2009; Swofford & Slattery, 2010) informed the development of the 'Resident Wind Farm Perception Survey.'
- 3. Interviews were conducted over the summer and fall of 2010 after two years of exposure to wind turbines.
- 4. Only those residents who were landowners appeared on the tax assessor's list, and included in the one per household mail survey in the sampling of 1,000 residents of four townships in Huron County, Michigan. Only permanent or full-time homeowners were included in this study.
- 5. The mail survey was distributed at the end of January 2011 and was 'closed' the beginning of March 2011.

- 6. While there are many forms of engagement, meeting attendance was the only behavioral item used to measure the level of resident engagement with planning processes.
- Profiling four townships as the unit of analysis does not infer a representation of all Huron County homeowners.

## Limitations

The study was limited by the following factors:

- Survey participants represented in the sample of residents in the four selected townships may or may not represent all residents in that community or other communities; this research does not estimate non-respondent bias that may exist from those who did not complete the questionnaire.
- Data collected represented opinions after the construction of two wind farms, which may have influenced how some individuals answered certain questions (i.e., perceptions before wind farms were built).
- 3. Only those residents who appear on the property tax assessors list were included in this study; those residents who do not own property (i.e. renters) were not included. This list did not signify any relationship between residents and wind developers (i.e. acknowledgement of wind development contract/lease or turbines on property). There was no way to easily cross-reference the tax assessors list and the database that contained the information of who currently had wind development contracts or turbines. A landowner in any of the townships studied who may or may not hold a contract or turbine on their property, and lived outside one of the four townships were not represented in the sample.
- 4. A budget of \$2,000 constrained the sampling of residents to only four townships.

5. All subjects who received a mail survey were not randomly selected. Two townships (Oliver and Rubicon) had a proportionately smaller population of land owning residents than the other two townships (Bingham and Sand Beach) included in this study. All permanent, land owning residents in Oliver and Rubicon townships were included in the mail survey.

## Hypotheses

The study was designed to test the following hypotheses:

- Proximity of residence to wind farms negatively influences perceptions and support of wind farm development.
- Knowledge (controlling for attendance of meetings) of wind farms positively influences perception and support of wind energy development.
- 3. Ownership of land positively influences wind energy perception and support, controlling for city versus rural residency location. Owners of large tracts of rural land hold more 'use-value' than owners of small tracts of land who focus more on 'existence value'.
- 4. Economic beliefs are the most significant factor in shaping perceptions and support of wind farm development compared to social or environmental beliefs.

## **Definition of Terms**

For consistency of interpretation, the following terms are defined:

<u>Community Engagement:</u> Building a shared understanding for the mutually beneficial exchange of knowledge and resources in a context of partnership and reciprocity (Boyer, 1996; Rogers, 2005; Ward & Moore, 2010).

<u>NIMBY (Not-In-My-Backyard)</u>: "The phenomenon that certain services are in principle considered as beneficial by the majority of the population, but that proposed facilities to provide these services are in practice often strongly opposed by local residents" (Swofford & Slattery, 2010, p. 2509).

<u>Renewable energy:</u> Energy which comes from renewable resources such as sunlight, wind, rain, tides and geothermal heat, which are naturally replenished. Fossil fuels, such as coal and oil, are considered non-renewable resources because they are consumed much faster than nature can create them (Nordman, 2009b).

Social exchange: The term used to describe social behavior as the process of exchange – maximizing benefits while minimizing costs in coming to a decision (Chadwick-Jones, 1976; Cook, 1987; Skidmore, 1975).

<u>Sustainable development:</u> Development that improves the social well-being, environmental and economic conditions of current and future generations (Audirac, 1997; Fergus & Rowney, 2005; Gilchrist, 2004; Jepson, 2004; Stimson, Stough, & Roberts, 2006).

<u>Wind lease:</u> An agreement signed by a landowner that grants a developer the right to use their land for wind development, and in return, provides compensation to the landowner. Typically, the developer owns any turbines that are put up and does all of the work of developing the project. Wind leases are binding legal documents that typically cover 30 to 60 years or more. These agreements can allow turbines to be constructed on privately owned, actively farmed land (Nordman, 2009b).

Wind turbine: A machine that captures the force of the wind (Nordman, 2009b).

### Chapter 2

### Literature Review

The literature related to residents' perception of wind farm development is reported in this chapter. Literature was reviewed from community development, recreation, land use, economics, renewable energy and tourism journals. Research on sustainable development in recent years has placed more emphasis on the importance of interaction between policy makers and the community. For organizational purposes, the topics covered in this paper include sustainable development, public perception, trust, proximity to wind turbines, community engagement and theoretical base. While many other aspects such as poverty, unemployment rates, and cost of living are important to how communities perceive and adapt sustainable development innovations, those topics will not be addressed in this thesis.

## Sustainable Development

Governments around the world are identifying environmental sustainability as a "major driver of technological and economic development—with innovative direction being found at the interface of our efforts to become more socially and environmentally sustainable" (Rogers, 2005, p. 109). Rural communities, "faced with the pressures of unprecedented change, have an opportunity to embrace the principles of sustainable development, to create a new future at the leading edge of global change—but they need help. They need both knowledge and skills to enable them to self-evaluate and strategically plan, and they need a highly motivated, creative, and coherent community to carry it through" (Rogers, 2005, p. 109).

Sustainable development is a form of progress that integrates social, economic, and environmental objectives within a single strategy or program (Fergus & Rowney, 2005;

Gilchrist, 2004; Jepson, 2004; Stimson, et al., 2006). While the term "Sustainable Development" was brought to fruition by the World Commission on Environment and Development in 1987, the importance of rural communities' involvement in sustainable development projects in recent years has begun to make research headlines (Lane, Vanclay, Wills, & Lucas, 2007; Rogers, 2005; Roseland, 2000). Research suggests that the inclusion of the local community aids in the success of sustainable development projects. For example, Rogers (2005) suggested that the process of community engagement could be used to draw together the concepts of community-based indicators of sustainability, triple bottom line performance evaluation (i.e. social cohesion, ecological foot-printing, and economic activity) and cultural activities as a tool to spur engagement.

Keller (2001) stated that to "survive, and even prosper, rural communities will need to embrace change rather than rail against it, and adopt new forms of innovation and development which will leave very little unchanged" (p. 110). According to Elliott (2000) and Cash and colleagues (2003), science and technology must "play a more central role in sustainable development" (p. 8086). Nash, Martin and Krishnan (2007) and Blazevic (2009) suggested that renewable energy projects such as wind farms have "no negative impact on tourism" and may actually draw in more tourists (Blazevic, 2009, p. 180). A study conducted of tourists' attitudes toward renewable energy in Australia implied that tourists desire "environmentally friendly accommodation[s] and renewable energy supply"; these tourists also preferred to see wind turbines onshore as opposed to offshore (Dalton, Lockington, & Baldock, 2008, p. 2174). This tourist preference could aid communities in further diversifying their economies by expanding their sources of income, while becoming more sustainable in the process and ultimately gaining more public support.

### **Public Perceptions**

As countries look for more sustainable energy sources, the focus on wind energy development is becoming increasingly relevant. Wind is an infinite resource that is costless and available for harvesting. As communities are approached with a proposal for developing a wind facility, local opposition greatly slows the process of moving forward. Even though wind energy is generally accepted in principle, it is not uncommon for opposition to exist when facilities are actually developed. NIMBY (Not-In-My-Backyard) has long been the term that is used to explain any and all local opposition to any development in a community. However, in recent years the term NIMBY has come under close scrutiny from researchers looking to explain what else may be driving local opposition (Jones & Richard Eiser, 2010; Swofford & Slattery, 2010).

In general, public support for wind development is high (Jones & Eiser, 2009; 2010; Swofford & Slattery, 2010). Researchers, however, are addressing the fact that "despite high levels of public support for onshore wind development in principle, specific projects often experience local opposition" (i.e. social gap) (Jones & Eiser, 2009, p. 4610). Research in this area has found that the over-used term of NIMBY is generally not applicable as the dominant and only reason that local opposition exists. NIMBYism alone cannot describe the general acceptance of wind energy in the face of local opposition. Recent studies have suggested that lack of community involvement in the planning stages, uncertainty regarding the proposals, and place attachment are just some factors that continually become apparent in resistance of wind development (Jones & Eiser, 2009; 2010; Swofford & Slattery, 2010).

Scholars suggest that NIMBYism is one of three hypothesized explanations for this 'social gap' (Bell, Gray, & Haggett, 2005; Jones & Eiser, 2009; 2010; Swofford & Slattery, 2010) Researchers hypothesized that 'democratic deficit' and 'qualified support' are other

possible reasons to explain this phenomenon. The 'democratic deficit' hypothesis claims that those who oppose a planning decision hold more sway over decision makers than the silent, but supportive, majority. This means that "wind farm proposals can be rejected even in the face of [the local] majority (but inactive) support" (Jones & Eiser, 2009, p. 4604). The 'qualified support' hypothesis claims that "whilst people might support wind power in principle, there are often caveats to this support" (Jones & Eiser, 2009, p. 4606). The question stands as to what is driving support or opposition to planning projects.

Jones and Eiser (2010) and van der Horst (2007) both agreed that NIMBYism alone is not the only prevailing factor in determining acceptance of a wind energy project. They argue that there are many other contributing factors. Van der Horst (2007) offered a plethora of reasons why people may be opposed to development. People may not agree with a part of the process, the fear of the unknown, and utilitarian value placed on the land are just some of the reasons van der Horst (2007) offers as other explanations. Jones and Eiser (2010) concurred with van der Horst (2007) that the value people place on land differs among people and that could play a part in resistance to change. 'Existence value' is often correlated with emotional attachment and is commonly associated with retirees who migrate into a rural community to get away from urban life. They place value on the 'rurality of their new home' and are less likely to agree with significant change. Conversely, those who focus on 'use-value' (i.e., those predominately focused on farming) are more open to the idea of mixed land use as they hold less emotional attachment to the land.

While van der Horst (2007) primarily focused on whether initial opinions (prior to any local project) were significantly different from post-project opinions, Jones and Eiser (2010) focused more on how distance from a proposed site affected opinion. Jones and Eiser (2010) concluded that visibility of a proposed site would attribute to the spoilage of the landscape and

would therefore decrease the acceptance of wind development. They also determined that proximity did not play as big of a role in the Sheffield study as they initially thought it would. Hills located near participants created a 'separation' or 'distance' that led to more community acceptance. In the analysis, Van der Horst (2007) did not include visual separation as one of the determinants of local opposition. In the end, however, both studies determined that a more integrated, collaborative process was needed between community members and wind developers. One suggestion was for the developers take a more bottom-up approach and less of a top-down approach when 'courting' a new community. Researchers suggest that the term NIMBY is lacking in many areas and needs either to be defined more stringently or cease from being used all together (Swofford & Slattery, 2010). A single term, like NIMBY, is inadequate for explaining a complex social situation but there is hope that further research will provide more explanations. Communities are constantly changing in areas of politics, zoning, development, etc., and therefore cannot be considered static and isolated. Consequently regular and involved dialogue between all community stakeholders is one key to success of wind farm development. Obtaining the trust and support of local residents and knowing their ability to adjust to changes cannot be disregarded.

### Trust

Public support can be gained or lost by the amount of publicly held information regarding the new technology in question. Mumford and Gray (2010) stated that trust allows for individuals to save time by assuming that information coming from a trusted individual/organization is indeed factual and that time does not need to be taken to ensure truth lies in every statement made. Trust allows people to deal with new situations and new technology more quickly because they are able to overlay their own thoughts with those of others (Mumford & Gray, 2010). Ricci *et al.* (2010), however, argued that more is involved in that process than pure trust.

Ricci *et al.* (2010) believed that the various roles that a person maintains in everyday life (consumer, resident, citizen, kin-keeper), condition the way a person views the world. It is through this lens that decisions are made and not necessarily solely trust. The study conducted by Ricci *et al.* (2010) indicated that when issues are relatively unfamiliar to individuals, "people are more likely to be swayed by what they think an investigator wants to hear" (p. 2635). One could assume that people also dictate their responses to questions based on that they want to please an investigator and do not want to 'lose-face.' Ricci *et al.* (2010) agreed with Mumford and Gray (2010) in that if a person encounters a new technology and they can equate it with something that is familiar, they are able to intertwine the pieces of information whether they are actually similar or not.

Both Mumford and Gray (2010) and Ricci *et al.* (2010) found that distrust in the source of information was a contributing factor in whether people accepted new technology. Results indicated that people trusted governments and for-profit industry less than they did their peers or non-profit organizations. People viewed private industry as self-serving and were hesitant and skeptical about believing any information put forth by such organizations. It was also found in the studies that people often felt let down by local government as they assumed that the local governing power would have taken a larger role in the regulation of a new industry. More often than not, governments allowed and encouraged private businesses and the public to interact. Without the assistance of the local governing body to act as a facilitator, people felt as though their opinions were not being heard.

The conclusion from both Mumford and Gray (2010) and Ricci *et al.* (2010) is that more collaboration is needed between all stakeholders involved in a new endeavor. Quality 'face-time' could lead to a more trusting relationship between all parties and a more successful well-rounded future for a community. The more 'trusted' information that a public holds, the more they will be willing to seek out other alternatives and advocate for options that will keep costs low, yet lower the overall carbon-footprint. As evidenced in Mumford and Gray (2010) and Ricci *et al.* (2010) collaboration is key in moving forward and ensuring that a trusted party exists in the community to act both as facilitator between stakeholders and to act as a disseminator of information is crucial to the success of a project. If residents are unable to make an educated decision on the current status of a situation then the future of a community could be austere.

## Proximity to Wind Turbines

As concern for climate change and carbon emissions continues, the focus on renewable energy, specifically wind energy, and the attitudes held by residents that surround a renewable energy facility will continue to grow (Jones & Eiser, 2009; 2010; Swofford & Slattery, 2010). Research suggests new technology has allowed wind energy development to come into competition with fossil fuels for energy production as the new technology is aligning itself with the price of fossil fuel extraction and production (Swofford & Slattery, 2010). As research continues, results indicate that while general acceptance for wind energy development exists, local opposition often stands in the way of development (Jones & Eiser, 2009; 2010; Swofford & Slattery, 2010). If the state of Michigan is to meet the renewable energy quota by 2015, community planners need to understand why residents hold certain perceptions about renewable energy production.

While both Swofford and Slattery (2010) and Jones and Eiser (2009; 2010) examined the attitudes towards wind energy, the authors did so using different techniques and also sought to answer slightly different research questions. One of the goals of Swofford and Slattery (2010) was to determine if proximity to wind farms influenced the attitude of local residents. One wind farm in northern Texas was chosen as the target research region and the circular areas around the wind farm were divided up into zones using predetermined measurements: Zone A (0-5 km), Zone B (5-10 km), and Zone C (10-20 km). This "allowed survey responses to be separated into geographic zones in order to examine the effect ... proximity had on public attitudes" (Swofford & Slattery, 2010, p. 2512). Jones and Eiser (2009), however, sought to identify more predictors of attitudes (general and specific attitude towards wind development) than just proximity. Ten locations in the United Kingdom (5 near wind farms and 5 away from wind farms) were chosen for a comparison of attitudes to evaluate if proximity played a factor. Results from recent studies (Jones & Eiser, 2010; Swofford & Slattery, 2010) indicated that an inverse relationship between proximity and positive attitudes exists; whereby public acceptance of wind development decreased the closer one located to the wind farm(s).

However, research suggests that while the mandates and deadlines to meet renewable energy goals vary from country to country, the interplay of proximity to wind farms on public perceptions do not. More research is needed to further understand the complexities that go into forming opinions on a relatively new technology. However, Jones and Eiser (2009) and Swofford and Slattery (2010) are in agreement in how to provide the best opportunity for development to come to fruition. Community education is needed on the topics of environmental issues, the different types of renewable energy and what options exist to a community to allow for a more trusting, connected community that is more likely to accept and embrace this new technology in the future. If community members are engaged in the process

and understand that we are deeply connected with the environment, their involvement in decision-making may lead to a brighter, more prosperous future.

## **Community Engagement**

There is a general agreement that humans cannot be considered separate from nature (Berkes, 2004). Modern environmental management literature stresses the need for inclusion of community in decision making to foster community empowerment and acceptance (Eltham, Harrison, & Allen, 2008; Fraser, Dougill, Mabee, Reed, & McAlpine, 2006; Wolsink, 2007). Lane (2007) conducted research in a rural community of Australia where her aim was to study how an increase in community engagement promoted interest in local environmental issues. The implication of Lane's study was that "creative expression assists in building capacity for civic engagement of all kinds and has the potential to extend the set of ideas currently in circulation about place, community, and environmental change" (Lane, et al., 2007, p. 161). If capacity building is to be achieved, it is important for residents to have a say in the direction of the future of their community (Devine-Wright, 2005; Jones & Eiser, 2009; 2010; Swofford & Slattery, 2010). Lane (2007) found that the initial approach to program development could significantly shape the range of issues presented and the nature of "communicative forms established" (p. 159). By including the community from day one, communication keeps the community involved and vested in the project because their voices are heard and concerns addressed.

Arnstein (1969) argued however, that there are eight different levels of participation ranging from the lowest level of participation - manipulation (nonparticipation) to the highest citizen control (citizen power). Each level, or rung, offers different benefits and opportunities and should be utilized for different reasons. Arnstein (1969) stated that the real objective of the bottom rungs of manipulation and therapy "is not to enable people to participate in planning or

conducting programs, but to enable power holders to 'educate' or 'cure' the participants" (p. 242). The author also went on to say "there is a critical difference between going through the empty ritual of participation and having the real power needed to affect the outcome of the process" (Arnstein, 1969, p. 217). At higher levels of participation, citizens are able to negotiate and have the majority say in decision-making. Blair (2004) suggested, people want to be involved and have a stake in the plans that affect them. Local strategies on how to position communities for a sustainable future are changing. There is an increase in self-development that "emphasizes self-sufficiency, local capacity, resources, and sustainability" (Blair, 2004, p. 106). Julian and Reischl (1997) determined that public participation is often limited in the planning stages of community development. Residents within a community need to have the opportunity and desire to 'move up' the ladder to have more of an impact on decision-making. While community engagement alone cannot guarantee a community achieving sustainability, self-sufficiency, and a better quality of life significantly improve (Blair, 2004; DeFilippis, 2001).

While some sustainable development studies have been conducted in rural areas (Joireman, Posey, Truelove, & Parks, 2009; Lane, et al., 2007; Rogers, 2005), these areas are usually in countries other than the United States (Jones & Eiser, 2009; 2010). The lack of attention paid to the importance of community engagement in rural sustainable development results in inadequate knowledge of the relationship between the two. Research suggests that rural communities can contribute to the success of sustainable development by becoming a part of the solution (Jones & Eiser, 2009; 2010; Swofford & Slattery, 2010). Conventional top-down system approaches have failed to realize successful sustainable environmental management in the past. Thinking holistically and with the notion of systems being interconnected is important in sustainable development. The objective of sustainability at the local level is to capture as

much economic activity as possible in order to maximize multiplier effects to aid in revitalizing the economy (Day, 1998). Sustainability requires a collective shift in action, empowering communities to take control of their own destiny while still maintaining their national and regional ties (Shortall & Shucksmith, 2001) Opponents say that community involvement is a slippery process; the opportunity exists for citizens to stay in their economic status overtime. Money is often the main focus in setting agendas. Often times issues related to economics get the attention of decision-makers. Putnam (2000) contradicted that by saying, "civic connections help make us healthy, wealthy, and wise" and advocated for more involvement with local communities (p. 287). This phenomenon is of interest to the wind industry in order to find explanations as to why people either support or do not support progress, reinvention and adoption of new economies in their local environment.

European countries are fast approaching deadlines to increase renewable energy production. Research and the continued slow progress in production has emphasized the need for public participation in local planning efforts (Higgs, Berry, Kidner, & Langford, 2008; Rogers, Simmons, Convery, & Weatherall, 2008). There are various schools of thought on the best way to involve local residents into the success of renewable energy facilities. Higgs et al. (2008), for example, recommended using software programs such as Geographical Information Systems (GIS) to take into account the various viewpoints of local residents. Using GIS to visualize the components of Multi-Criteria Decision Analysis (MCDA) is suggested to increase community support for renewable energy projects as community members will feel more engaged in the planning process. Rogers et al. (2008) suggested that decentralizing renewable energy projects from the commercial to the community level will achieve the same result.

While Rogers et al. (2008) and Higgs et al. (2008) approached community participation using two different methods, one would be inclined to believe that they would support the claim of the other. Attaining 'buy-in' from the community can be achieved from the use of visualization in which the community can see beforehand how construction will affect the community on an environmental and aesthetic level. The level of support will increase as residents feel like they were a part of the process and feel as if they have a stake in the process. Using software such as GIS is a way to 'layer' information to see how different decisions will affect the 'lay of the land,' however this software is constrained to the information readily available in databases. GIS is not all inclusive of every decision or preference that community members may consider. This could be a drawback in trying to 'unite' or bring the community to a consensus on where to site a renewable energy project and to decide upon the scale of the development.

Rogers et al. (2008) suggested that giving the power to the local community in determining the size, scale and placement of a renewable energy facility will allow for community engagement and an increase in the success rate of construction. This success is often determined on what expectations the community has and what negative outcomes will be incurred. In the study conducted by Rogers et al. (2008), residents were found to welcome the idea of a locally run renewable energy project yet lacked the resources or know-how to achieve this desire. Residents are more apt to favor renewable energy if there are incentives (i.e. warmer house, saving of money) associated with the local siting of a facility. If the negative (visual change in the landscape) are determined to outweigh any positive outcomes, the construction of the facility could be halted in its tracks. The authors both agreed that more research is needed in all areas of public participation in renewable energy planning.

### **Theoretical Basis**

Social-exchange theory aides in explaining the relationship between people and the environment. This theory includes a "collection of explanations, propositions and hypotheses, embodying certain assumptions about social behavior" (Chadwick-Jones, 1976, p. 1). While this theory can be helpful, some may view the inadequacies for understanding the full dynamics of the human dimension as problematic (Emerson, 1987; Johansson & Laike, 2007). Socialexchange theory can explain how residents perceive their personal benefits and how that reflects in a higher increase in support of sustainable development; community members feel that they will be getting value from their involvement. The benefits can be of social, economic or ecologic value. In the case of renewable energy projects, NIMBY has often been used to describe the resistance in local opposition in the face of general approval. This term has been challenged as being too simplistic. Social-exchange theory, conversely, can explain how residents perceive their personal benefits and how that reflects in a higher increase in support of wind energy. Social exchange theory is immersed with social psychology and social perspectives that explain social change and stability as a process of negotiated exchanges between parties (Chadwick-Jones, 1976). For example, all human relationships are formed by the use of the subjective cost-benefit analysis and the comparison of alternatives. This can help to explain why some people are open to wind turbines and some are not. To some, the economic benefits outweigh any environmental and social costs, however additional studies (Johansson & Laike, 2007) have listed other factors that may influence behavior.

Johansson and Laike (2007) found that "the perceived unity of the environment became the only individual significant predictor" in identifying the intention to oppose local wind turbines; unity being defined by the authors as how well the various components in the environment fit and function together (p. 445). While the results of this study confirmed

previous results from other scholars, "rather few of the investigated perceptual and attitudinal factors seem to be critical" (Johansson & Laike, 2007, p. 447). The most important factor deemed by Johansson and Laike (2007) for reducing public intention to oppose wind turbine development seems to be the aesthetic appeal and fit with the surrounding environment. While the authors of this study utilized the Theory of Planned Behavior, Chadwick-Jones (1976) very well may have argued that Social Exchange Theory would explain any intention to oppose development as well. The Theory of Planned Behavior "deals with the antecedents of attitudes, subjective norms, and perceived behavioral control, antecedents which in the final analysis determine intentions and actions," and which also "postulates that behavior is a function of salient information...relevant to behavior" (Ajzen, 1991, p. 189). While there is plenty of evidence for significant relations between the acting variables, "the exact form of these relations is still uncertain" (Ajzen, 1991, p. 206). Social Exchange Theory is "limited to actions that are contingent on rewarding actions from others" (Emerson, 1976, p. 336). One could say that the rewards of the development (within a community) outweigh any costs (i.e., spoilage in the landscape). Wind developers may be able to utilize this information in further wind farm construction and mitigate any negative responses from the community by presenting positive information about the construction and choosing aesthetically pleasing locations to minimize the local impact.

Jolivet and Heiskanen (2010) explored the use of the Actor-Network Theory (ANT) to shed light on the complexities and intricacies of policy, participation and perception surrounding wind farm development. ANT draws on a large experience of innovation processes and management studies and has "developed concepts to help seize both the local dynamics of actors' resistance in specific project and the close intertwining of the social and material nature of such processes" (Jolivet & Heiskanen, 2010, p. 6747). The concepts of 'framing,' (a process

through which actors come together to establish a common world and achieve a collective scenario of a desired outcome), and 'overflows,' (the repercussions that follow when actors do not "conform to expectations, adopt conflicting positions and develop their own interpretations of the project" and in affect ensuring that new frames are enacted), are the crux of this theory. The authors applied ANT to a wind farm project in the South of France. Framing occurred when a site was determined to house the five turbine wind farm and the surrounding municipalities, or actors, were invited into the discussion of planning for the potential to recreate this specific area as one that is future focused (no longer reliant on coal mining) and which would allow for economic development through acting as a tourist destination. A large neighboring city, not included in the planning discussion, felt as if they would be negatively impacted by co-visibility (i.e. wind turbines were visible outside of the scope of the initial discussion ring). This city disagreed with the current 'framing' and built their own vision for the wind farm (i.e. overflow). This vision became an alternative that could not be ignored. Jolivet and Heiskanen (2010) suggested that "project managers should be wary of 'recipes' for participation" and that a successful wind farm development is continuously reframed and adapted "to channel and stabilize the process of wind farm creation, and gradually make it a shared material reality that fits its environment" (p. 6753).

With all of the theories and models that are available today, why is there still a problem getting communities or individuals to support sustainable development? One explanation is that human behavior is persistently multifaceted. Not one individual theory or model can be used to analyze why people become involved in their community. An interdisciplinary approach is needed to see how and why different variables affect one another. Looking only from one perspective, without understanding how the different theories interact, would make it next to

impossible to suggest a viable solution for improvement and success. More research is needed on the interplay of humans and the environment.

## Summary

The importance placed on perception and community engagement regarding sustainable development is about a decade old. Research suggests that the theory of NIMBY does not adequately portray local opposition to a project. Recent literature suggests that NIMBY is only part of the explanation and that further research is needed to fully understand what influences a persons' perception on renewable energy. Evaluating residents' perceptions of wind farm development is important as an emphasis is being placed on renewable resources as energy sources (Swofford & Slattery, 2010). While wind farm development can help to diversify the economy, there is a still a difference between the general acceptance of such proposals and local oppositon that needs to be addressed. This literature review indicated that there are still many areas that need further research. If responsibly planned with local residents, wind farms can be a viable option for many rural communities and can lead to more positive perceptions, potential growth in the economy and an overall increased quality of life.

## Chapter 3

### Methodology

The focus of the research was on the factors influencing wind farm perceptions held by residents in four townships in Huron County, Michigan with current or future wind farm development. This study utilized both qualitative and quantitative research methods. Specifically, the study sought to answer four research questions. The first was "Does an inverse relationship exist between the proximity of a residence to a wind farm and positive perceptions of wind development among residents?" The second question was, "Does the level of attendance of wind zoning meetings in the planning process of wind farms influence the support for wind farm development among residents?" The third question asked, "Does the amount of land owned affect perception and support of wind farm development among residents?" The final question was, "What belief factor outcomes contribute to perceptions of wind farm development among residents?" The conduct of the study included the following organizational steps: (a) arrangements for conducting the study, (b) development of interview instrument, (c) selection of interview subjects, (d) procedures for gathering and analyzing interview data, (e) development of survey instrument, (f) selection of survey subjects, (g) administration of the survey instrument, (h) treatment of the data, (i) interpretation of findings, and (j) policy implications.

### Arrangements for Conducting the Study

The study was conducted in Huron County, Michigan upon receipt of a human subjects safeguard clearance regarding the participant consent (see Appendix A) and interview guide (see Appendix B) from the Institutional Review Board from Michigan State University. The study format comprised of interviews of a small sample of local stakeholders (n=11) followed by a mail survey to a larger sample (n=1,000) of residents.

### **Development of Interview Instrument**

The interview instrument was developed based on issues that were reoccurring in the local newspaper, issues that emerged in talking with residents in the county, issues that were raised during public comment sessions at monthly Huron County Board of Commissioners meetings and issues this researcher thought were important and meaningful in studying perception. The interview instrument was divided into five overall categories: demographics, economic development, wind farms, sustainable development and community development.

### Selection of Interview Subjects

The first stage of this research was interviewing a subset of different stakeholders regarding wind farm development within Huron County. The five stakeholder groups included landowners with contracts/turbines on their property, landowners without contracts, rural homeowners (those outside of the city/village limits), village residents (those living within village/city limits) and community decision makers. This researcher conducted two to three audio-recorded interviews per stakeholder group in summer and fall 2010. The interviews allowed the formation of major themes to be developed. This preliminary research also allowed for the formation of hypotheses. Rubin and Rubin (1995) stated, "Design in qualitative interviewing is iterative. That means that each time you repeat the basic process of gathering information, analyzing it, winnowing it, and testing it, you come closer to a clear and convincing model of the phenomenon you are studying" (pp. 46 - 47). This seemed to be the case in interviewing a total of eleven local residents in Huron County using a semi-structured, twentyseven question interview guide. Interviewing is a complex and delicate procedure that requires advanced planning and forward thinking. Like most research methods, this is not something that one conceives and completes without mindful consideration of the root of the issue. The
researcher must have a clear direction in what he or she expects to gain from the interviewee in order to keep the interview going in the right direction. Babbie (1998) noted that interviewing is much like a normal conversation, however one must be mindful "that you are *not* having a normal conversation" (p. 292). Two individuals (a rural resident and a community decision maker) were initially chosen as interviewees. The remaining nine interviewees were determined by utilizing the snowball sampling technique. Kumar (1996) stated that "snowball sampling is the process of selecting a sample using networks;" interviewees suggest others to interview (p. 162).

### Procedures for Gathering and Analyzing Interview Data

Once the amount of detail and depth was determined in interview transcription, the dialogue was transcribed into detailed notes including some quotations. Following this step, the coding process began. There is a prodigious amount of ways to code data (Babbie, 1998; Bernard, 2010; Boyatzis, 1998; Glesne, 2011; Saldana, 2009). In thematic analysis, the researcher organizes the coded data and identifies patterns or themes. Glesne (2011) stated that "making comparisons is an analytical step in identifying patterns within some theme" (p. 188). Thematic analysis is a way to encode qualitative information.

There are three distinct stages of thematic analysis and they are: (a) deciding on sampling and design issues, (b) developing themes and a code, and (c) validating and using the code. In the first stage, a researcher must determine what and how many of a population will be sampled and design their research instrument accordingly. Within the second stage of developing themes and a code "there are three different ways to develop a thematic code: (a) theory driven, (b) prior data or prior research driven, and (c) inductive or data driven" (Boyatzis, 1998, p. 29). Theory driven code development is the most common used approach in social science research and one

that this researcher employed. The researcher begins with a theory and then "formulates the signals, or indicators, of evidence that would support this theory" (Boyatzis, 1998, p. 33). Theory driven codes are subject to the researchers' beliefs and assumptions and this may prove difficult to determine what the interview data may be truly saying. In the third stage of 'validation and using the code,' the researcher double checks to ensure that consistent coding is taking place and that codes are clearly defined.

Key concepts from the interviews were placed in a large matrix with the interview questions in a row along the top and the interviewees in a column along the left hand side. This researcher formulated eight major themes. These themes helped to forecast the answer to the research question, "What belief factors contribute to a positive, negative or neutral perception of wind farm development." In an effort to be transparent in motives and procedures utilized, researchers should be clear in their relationships to their subjects or the research topic in general so that others may determine if there are any biases in the research or analysis. This researcher was originally from Huron County and the interest to study wind farms was developed from wind farms constructed there. In addition, the first two interviewees this researcher had met once before which implies there was some sort of standing relationship before the interview started. This researcher however did not feel that impeded the results; the interviewees felt more comfortable sharing information. As was indicated earlier, the interviews helped to inform a survey, which was distributed in early 2011 to further analyze factors influencing perception of wind farm development.

## **Development of Survey Instrument**

The survey instrument, 'Resident Wind Farm Perception Survey,' was developed based on the themes that emerged from the interviews and also from studying two similar instruments developed by researchers who had implemented surveys on wind farm perceptions elsewhere one in Texas (Swofford & Slattery, 2010) and one in the United Kingdom (Jones & Eiser, 2009). The Texas study utilized a mail survey to "identify the physical and environmental characteristics that are linked to both negative and positive perceptions of wind farms" of 1,500 randomly selected households within a 20 km radius of a wind farm (200 were returned) (Swofford & Slattery, 2010, p. 2512). Frequencies were used in data analysis. The UK study utilized a door-to-door survey of 1,200 households (600 to target towns within one mile of a turbine and 600 to comparison towns) (843 surveys were returned). Chi-square tests, independent samples t-tests, along with simple and multiple regression, were utilized in analyses. This researcher contacted the authors of these studies and obtained a copy of the survey instrument they had disseminated in their study. Some survey questions were identical in nature to those distributed by Jones and Eiser (2009) and Swofford and Slattery (2010); this has aided in drawing conclusions and implications for further research. Dillman's (2000) mail protocol was also consulted to determine the best layout design, paper color, and spacing timeframe for reminder postcards and a follow-up survey.

The survey contained yes/no, open ended and Likert-type questions with nominal, ordinal and interval categories. The survey was broken into the following four sections: primary residence, perceptions of wind turbines and wind energy, level of support for wind energy and general demographics. Four questions regarding perceptions of wind energy were interval in nature while two questions regarding level of support included both interval and nominal categories. Two questions regarding perceptions held 'before' and after ('now') wind farm development were used in testing hypotheses about perceptions. The two questions asked about the general perception about wind energy both before and after development of wind farms in Huron County using a five-point Likert scale; very negative to very positive including the option

of 'no opinion.' One question (level of support for wind farms within Huron County) was used in hypothesis testing of level of support of wind farms. This question asked the locations the respondent would be willing to support wind farms using a five-point Likert scale; strongly disagree to strongly agree. One question of the survey regarding knowledge level of wind energy was used in hypothesis testing the influence of knowledge on level of support and perceptions of wind farms.

#### **Township Description**

Huron County is located in the "thumb" area of Michigan, which is surrounded on three sides by water – Saginaw Bay and Lake Huron. The county has a total land area of 824 square miles, which is 139 square miles greater than the average square miles for the other 82 counties in the state. Huron County ranks as one of the top agricultural counties in Michigan based on agricultural farm income. Some of the major crops grown include corn, navy beans, sugar beets, wheat and alfalfa, while major enterprises include dairy and livestock production. Huron County is an ideal setting for the tourism industry because of the natural beauty and ideal topography. Although small industry and tourism is included in the county's industry portfolio, agriculture remains the chief source of income for most residents (Government, 2006). In 2005 landowners in Huron County were approached by wind developers to lease land in exchange for a monetary incentive (generally around two dollars per acre). These 'signing bonuses' enticed landowners to enlist their land, with the promise of a sizeable sum of money (\$10,000) to be paid if a turbine was constructed on their property. Royalties from energy produced would be paid to those landowners who had leased land to that specific developer. Landowners who did not sign up land were excluded from any monetary benefit.

The study area is comprised of four rural townships in Huron County; two coastal and two inland. Bingham Township, population 1,751, is an inland community home to the largest

commercial-scale wind farm in Michigan, Michigan Wind 1. The project consists of 46 GE 1.5 megawatt turbines with a total capacity of 69 megawatts – enough to supply 20,000 homes with electricity. This project is expected to reduce over 124,000 tons of carbon dioxide annually (Development, 2007). Oliver township, population 1,626, is an inland community with a variety of entities from many small businesses to agricultural farms growing a variety of crops and livestock, to a Cooperative Elevator Company, a Tier 1 auto supplier and the second largest wind farm in the State of Michigan (Oliver Township, 2010). Harvest Wind Farm is located on 3,200 acres consisting of 32 Vestas turbines, each capable of producing 1.65 megawatts of electricity, for a total project capacity of 52.8 megawatts – enough to supply electricity to more than 15,000 Michigan homes. Harvest Wind Farm was the first utility-scale wind farm operating in Michigan. A Northern Michigan Company has an agreement to purchase the energy produced, which is sold to customers throughout Michigan. Ownership of the two wind farms was bought and sold numerous times by various companies in the last five years. As of April 2011, Exelon Corporation owns both wind farms in Huron County. As of April 2011 Exelon was not the only developer in the county - other wind developers were still actively pursuing wind farm projects within areas of Huron and neighboring counties.

Rubicon, population 778, and Sand Beach, population 3,307, townships are coastal communities. While neither of these townships had wind farms in 2011, plans for wind farm construction within Rubicon Township had been progressing towards that avenue. Sand Beach Township, while not formally being pursued by wind developers in 2011, had numerous acres enlisted in wind development leases. Sand Beach and Oliver townships do not reside under Huron County zoning and therefore procedures for any type of development must go through different channels for approval than Bingham or Rubicon townships.

#### Selection of Survey Subjects

Four townships in a single county (Huron) were purposely selected to study wind energy perceptions held by local residents. The townships were Bingham, Oliver, Rubicon and Sand Beach. Each township contained a village or city: Ubly, Elkton, Port Hope and Harbor Beach. The remainder of this thesis will refer to Bingham township as township #1, Oliver township as township #2, Rubicon township as township #3 and Sand Beach township as township #4. Townships #1 and #2 were chosen as they contained the only developed wind farms in Huron County. Townships #3 and #4 were chosen as comparison townships as they were neighboring, but non-adjacent, townships whose potential for wind development in the future is very good. In addition, township #4 is the hometown of the researcher. Two of the townships (#1 and #2) are inland and two are coastal (#3 and #4). Townships #1 and #3 had the opportunity to vote in November 2010 on two ballot measures to allow future wind farm development within Huron County. Townships #2 and #4 did not have the opportunity to vote on this issue as these townships do not reside under County zoning.

The Huron County Tax Assessors Office was contacted to acquire a list of names, addresses and parcel descriptions from the four townships in this study. A total of 10,390 addresses were obtained. In an effort to study primary residency only those entries in which the owner and property addresses matched were selected and placed into a separate database. All business, commercial, exempt, industrial and entries in which the owner and property addresses did not match were excluded. The townships had varying amounts of entries in which the primary and owner addresses matched: township #1 (including the village of Ubly) - 475, township #2 (including the village of Elkton) – 246, township #3 (including the village of Port Hope) – 177, and township #4 (including the city of Harbor Beach) – 771. Only 17% of the addresses acquired from the Tax Assessors Office were primary addresses. Since townships #2

and #3 had a proportionately smaller land owning resident population, it was deemed to be in the best interest to include all of these entries in the mail survey. The remaining 577 addresses were proportionately selected from townships #1 and #4.

The cumulative population of the two townships (#1 and #4) total primary addresses was 1,246. The method probability proportional to size was implemented to determine the number of addresses that should be selected from the remaining townships (Ott & Longnecker, 2010). Township #1 (475) was 38% of the total 1,246 with township #4 (771) being 62% of the total addresses. Each townships proportion were then multiplied by the remaining 577 addresses needed. To reach the goal of 1,000 addresses across four townships the following were the total addresses selected from each township: township #1 – 220, township #2 – 246, township #3 – 177 and township #4 – 357. Every other entry within townships #1 and #4 were selected from township #4 to reach the desired address amounts (See Table 1). In an effort to reach female landowners, every other female name in the tax assessors list was chosen as this list predominately lists male names first.

Township	Location	Wind Farms in 2010	Voted on Future Wind Development	Total Primary Addresses	Number of Addresses Selected for Study
Township #1	Inland	Yes	Yes	475	220
Township #2	Inland	Yes	No	246	246
Township #3	Coastal	No	Yes	177	177
Township #4	Coastal	No	No	771	357
Total				1,699	1,000

Table 1. Township Categorization

#### Administration of the Survey Instrument

The initial round of surveys were distributed on January 21, 2011. The 1,000 survey addresses were printed on address labels and a large postage stamp was affixed on each envelope. A cover letter and business reply envelope were included with the survey. Each survey was numbered one through 1,000 and entered into the address database to track those who had and had not responded. As surveys were returned, they were keyed into SPSS and marked as returned in the address database. Reminder postcards were sent out one week later on January 31, 2011. On February 11, 2011 a final mailing of cover letters and surveys were distributed to those who had not yet returned their survey. These surveys were assigned a new number prefixed with the number '2' to further track who returned surveys. These assigned numbers were also imported into the address database. The data collection period closed on March 4, 2011 at which time a table of random numbers was used to determine who would receive each of four \$25 Visa gift cards. The first four numbers of each randomly selected entry in the table of random digits was used to determine the winners. A cover letter accompanied the Visa gift cards in the mail.

#### Treatment of the Data

The interviews were audio recorded. The audio recordings were transcribed into detailed note form after each interview had taken place. Interview data analysis consisted of reading through all notes and coding the data. Open coding was used to break the data into larger categories and axial coding was used to create new categories by identifying relationships between initial categories. Each interview was coded and then transferred onto a large matrix. This matrix allowed the researcher to easily see patterns or anomalies between interviewees (Glesne, 2011).

Survey data were analyzed using frequencies, contingency tables, chi-square tests, correlations, ANOVAs and the Scheffe's Test along with linear regression utilizing an alpha level of p<.05. The Scheffe's Test was chosen because this can be used "to make all possible comparisons among the *t* population means, it is more conservative" and less sensitive than other procedures "for detecting significant differences among pairs of population means" (Ott & Longnecker, 2010, p. 476). There may be other procedures that are more powerful, but the Scheffe's Test still "finds the critical difference between any two sample means that is necessary to reject the null hypothesis that their corresponding population means are equal" (Sirkin, 1995, p. 303). The IBM SPSS Statistics, version 19 was used to analyze the data. Any incomplete questions were treated as missing values; they were not included in the analysis. Total columns are never presented in data analysis tables in this study. An overview of the steps taken to analyze survey data follows in Table 2.

Table 2.	Data	Anal	lysis	Steps
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Hypothesis	Steps Taken in Analysis
H <sub>1</sub>	<ol> <li>Chi-square testing for two variables with nominal, ordinal data and ANOVAs with interval, ratio data for each survey question</li> <li>Recoding townships within SPSS into two categories – those living within 1 mile or greater than 1 mile from a turbine</li> <li>Independent Samples t-testing of proximity and support; proximity and 'before' and 'now' perceptions</li> <li>Compute new variable to measure the change in perception from 'before' to 'now'</li> <li>Crosstabs: the number of survey respondents whose perceptions did not change over time (from 'before' development to 'now' – after</li> </ol>
	development)

$H_2$	1. ANOVA testing: independent variable- meeting attendance; dependent
	variable – knowledge of renewable energy, wind energy and sustainable
	development
	2. Bi-variate and Partial (controlling for meeting attendance) Correlation:
	independent variable- knowledge of wind energy: dependent variable –
	perception 'before' and 'now'
	3 Bi-variate and Partial (controlling for meeting attendance) Correlation:
	independent variable- knowledge of wind energy dependent variable –
	level of support of wind farms within Huron County
	4 Independent samples t-testing: independent variable – meeting
	attendance; dependent variables – perceptions, 'before' and 'now'
	5. Independent samples t-testing: independent variable – meeting
	attendance; dependent variable – level of support of wind farms within
	Huron County
H <sub>3</sub>	1. Compute a new variable – rural or village resident from responses to
5	survey question 1 – residency location
	2. Compute a new variable – creation of 4 categories of acres owned based
	on responses to survey question 2
	3. Chi-Square testing: independent variables – residency location (rural or
	village): dependent variables $-4$ categories of acres owned
	4. Independent samples t-testing: independent variable – residency location:
	dependent variables – perceptions 'before' and 'now'
	5 Independent samples t-testing independent variable – residency location
	dependent variables – level of support of wind farms within Huron
	County
	6 ANOVA testing: independent variables – 4 categories of acres owned:
	dependent variable – perception 'before' and 'now'
	7 ANOVA testing independent variables – 4 categories of acres owned
	dependent variable – level of support of wind farms within Huron County
H	1 Compute new variables (economic environmental social) based on
114	categorization of statements in question 8 regarding wind energy
	2 Compute new variables: economic average environmental average
	2. Compute new variables. contonne average, environmentar average,
	3 Reliability Analysis – internal consistency confirmed
	A Simple Linear Regression Analysis: independent variables – economic
	4. Simple Effect Regression Analysis: Independent variables – level of support
	of wind forms within Huron County
	5 Simple Linear Degression Analysis: independent variables economic
	5. Simple Linear Regression Analysis. Independent variables – economic,
	'hefore'
	6 Simple Linear Regression Analysis: independent variables – economic
	environmental and social averages: dependent variable – perception
	'now'

#### Chapter 4

#### Analysis of Data

The problem of the study was to determine what factors influence perception of and support for wind farm development. Included in the study was an attempt to prioritize which belief factors have influence over residents' perceptions. The analysis of the data is presented in this chapter according to the following topics: 1) interview results, 2) data-gathering instrument distribution, 3) descriptive finding, and 4) hypothesis testing.

#### Interview Results

Overall, this researcher interviewed 11 residents of Huron County. Research question 1, 'Does an inverse relationship exist between the proximity of a residence to a wind farm and positive perceptions of wind development among residents?' and research question 2, 'Does the level of attendance of wind zoning meetings in the planning process of wind farms influence the support for wind farm development among residents?' were unable to be supported or rejected from the responses to the interviews. Interviewees did not directly address these questions as the interviews were meant to create an understanding of the differing perceptions held by residents and to help inform the development of the survey instrument.

Importing interview data into a large matrix allowed for themes and patterns to emerge. Analyzing the matrix provided evidence for some support for the hypothesis that ownership of land influenced wind farm perception. Nine out of the eleven interviewees held either a positive or a neutral perception of the local wind farms (see Table 2). Those interviewees who own very little land are hold neutral perceptions, while those who own many acres hold positive perceptions of wind farms. Two of the interviewees were anomalies – they owned property yet held negative views of the wind farms. The level of uncertainty and fear of change may have

Interviewee #	Acres of Land Owned	Wind Farm Perception
#1	City Lot	Neutral
#2	City Lot	Neutral
#3	City Lot	Neutral
#4	Rural Lot	Neutral
#5	0 acres = Rural Renter	(+)
#6	85 acres	(-)
#7	120 acres	(-)
#8	140 acres	(+)
#9	560 acres	(+)
#10	700 acres	(+)
#11	N/A	(+)

Table 3. Interviewee Results - Land Ownership and Wind Farm Perception

been stronger in those two individuals than the rest of the interviewees. Uncertainty was one of the concepts that was determined to be a factor influencing the overall view of perception. While uncertainty was expressed by most of the interviewees, the majority still viewed wind farms in a neutral or positive manner. This preliminary finding would support hypothesis 4, 'Economic beliefs are the driving factor in shaping perceptions and support of wind farm development as opposed to social or environmental beliefs.'

Implementing thematic analysis allowed eight major themes to emerge. These themes helped to inform the research question, "What belief factor outcomes contribute to perceptions of wind farm development among residents?" The interview data indicated that the factors that were seen to be 'limiting development' (i.e. lack of highway, improved/widening of M-53), the 'potential for monetary gain', the 'potential for employment' and the 'potential for further increased interest in development' (by other companies) are some of the positive themes associated with favorability or a positive perception of wind farms. The environmental impact considerations constituted a danger to wildlife in bird migration and deer feeding grounds. The social themes including 'information source' and 'uncertainty' seem to lead to a more negative view of wind farms in the area. The last theme of 'perception' is segmented into both positive

and negative with the list of negatives (i.e., large body of misinformation, minds are made up and not easily changed, uncertain health effects on humans) far outweighing the common threads through the positive associations (i.e., additional source of revenue) (see Table 3). One

Emergent Themes				
Environmental	Economic			
Environmental Impacts	Monetary Incentives			
Social	Employment Options			
Information Source	Potential Development			
Perceptions	Limiting Development			
• Uncertainty				

Table 4. Interview Emergent Themes

additional common thread through the majority of the interviews was the escalating hardship in farming. This was not in itself made into a theme as this researcher saw this topic as more of a supporting issue than a main content issue. This appears to be a motivating factor in acceptance of wind farms in the face of a long list of uncertainties and seems to contribute to why economic incentives may override all negative aspects associated with wind farm development. This researcher would classify farming hardship as a subset of economic incentives.

The eleven interviewees felt strongly about a number of topics asked in each interview. The following statements from some of the interviews revealed that there were many factors influencing perceptions. Interviewee nine thought that jealously may have played a part in the surrounding negativism around the wind farms, but that the community "didn't go into this totally blind" as two charter buses filled with residents and community decision makers visited a wind farm in Fenner, New York before the wind farm construction began. This interviewee went on to say "the turbines in the area are purely economic – it's not because we want to be green." When asked what were some of the keys to success for the area this interviewee said, "there isn't a whole lot of anything that is considering coming into the area. Not that I'm locked

on green again, but solar panels could be something or electric cars. Nothing else is coming into Huron County – turbines are all we have."

Interviewee four sounded a little more pessimistic regarding wind farms. This interviewee focused on the amount of uncertainty regarding wind turbines, the developers, and the science behind wind energy generation. This interviewee admitted that most of the information obtained was through the newspaper or 'through the grapevine,' and had come to the conclusion that the wind developers 'tell you so much until they get them up and then things change. That is the scary part – once they get a toe-hold on the land where will they stop?" This interviewee thought that the construction was rushed and that not enough education was supplied to the residents, which only adds to the uncertainty in their eyes. "People are jumping towards the money and aren't thinking about the long-term effects." Interviewee six agreed and added that,

"less tax money is coming in and they [county officials] are looking for a lifeline – if that is paid by wind farms they [county officials] are going to grab it – bar any consequences. It is a way to keep a guaranteed stream coming into the county. Usually the dollar sign drives what happens – unfortunately that is what is driving their [county officials] desire to have 1,000 [turbines]."

Interviewee five spoke about the different perceptions surrounding the two wind farms and how the developer's process of approaching the community led to the perceptions residents hold today. In township #2 the wind developer, John Deere, "came and laid out everything in front of the people. Noble (the wind developer in township #1) signed up people before they ever went public...they approached it wrong – they bowled themselves into the community." This interviewee went on to say that "if you want to put rumors to rest – tell the truth. Misinformation is the biggest problem." This interviewee stressed the importance that misinformation played in shaping the perceptions of wind energy and wind farms. "We are all ignorant until we are taught." People will rarely deviate from the status quo unless they are presented with new information; "put figures in front of people – it would change minds or put efficiencies [hard numbers] in front of people." This interviewee also emphasized that "people look year to year and not decade to decade...we want what we want now ...this leads to big issues down the road."

Interviewee seven agreed that more information needs to be made available to the public and felt like the first round of development (in townships #1 and #2) was too rushed. Initially, the wind developers contacted only those landowners surrounding this interviewee who owned large tracts of land and did not approach this interviewee who owned only 120 acres. When the wind developers needed this interviewees' land to act as a buffer zone to make the siting and construction of a wind turbine possible this interviewee said, "We were not good enough in the beginning to be involved...why do you want me now?"

Interviewee eleven provided some clarification on the big picture of wind farm development and said,

"the goal of the [Huron County] Master Plan is to retain the 400,000+ acres of farmland and limit where new residential and industrial developments can occur. That is the reason we...developed the wind overlay concept maps [to] encourage wind development in prime ag land...this becomes a catalyst for ag preservation [and] discourage non-farm use in farm areas."

This interviewee stressed that the Master Plan was not eliminating, but intended to, discourage an isolated acre or two from residential development. Overall, the list of economic belief factors out-numbered the voiced environmental or social belief factors. After reviewing the initial conclusion of research question 3 (acres owned) and data from research question 4 (belief factors), this led to the conclusion that economic incentives have a stronger influence on perception than social or environmental beliefs.

#### **Data-Gathering Instrument Distribution**

The sample of survey recipients included 1,000 residents from four different Huron County townships. Each household was asked to return the survey in the postage paid envelope to the investigator. The results of the mailings are presented in Table 5.

	First Mailing	Second Mailing	Total
Surveys Sent	1,000	646	1,000
Number of Addresses Undeliverable	5	2	7
Surveys Returned	354	143	497
Percent	35%	22%	50%
Number Declined to Participate	6	0	6

Table 5. Mail Survey Statistics

The initial mailing yielded a return of 354 completed surveys (35 percent), 6 residents who declined to participate (6 percent) and 5 envelopes that were returned undeliverable (5 percent). A second mailing of 646 surveys yielded a return of 143 completed surveys (22 percent) and 2 envelopes that were returned undeliverable (2 percent). A total of 503 (50 percent) residents failed to complete and return the surveys by the data collection closing date.

### **Descriptive Findings**

The age of all survey participants ranged from 23 to 94 years of age with the average age of respondents being 58 years old. An even distribution (50/50) of male (n= 247) and female (n=242) respondents completed the survey with eight participants omitting their gender. A chi-square test revealed that all four townships were similar with respect to the number of male and female respondents (p>.05) (see Table 6). The range of number of years living in Huron County over the participants lifetime ranged from 1 to 94 years with 44 years being the average length of time spent living in Huron County (see Table 7).

Table 6. Gender by Township

		With Wind Farms		Without Wind Farms		Chi-
		<i>Twp #1</i>	<i>Twp #2</i>	<i>Twp #3</i>	<i>Twp #4</i>	Square
	Male	48.2%	51.4%	55.1%	49.4%	1.083
Gender	Female	51.8%	48.6%	44.9%	50.6%	

*Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach* 

<sup>a</sup>No significant differences were revealed. \*p<.05, \*\*p<.01, \*\*\*p<.001

Table 7. Age and Mean Length of Residency

	With Wind Farms Without Wi		ind Farms	nd Farms		
	Twp #1	<i>Twp #2</i>	<i>Twp #3</i>	<i>Twp #4</i>	F	Comparison
Mean Age	54.3 yrs	59.4 yrs	59.7 yrs	57.6 yrs	3.283*	n.s. <sup>a</sup>
Mean length of	43.6 yrs	49.1 yrs	38.4 yrs	43.1 yrs	5.452**	2>1
Residency						

Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach <sup>a</sup>No significant mean group difference.

\**p*<.05, \*\**p*<.01, \*\*\**p*<.001

The following include the number of respondents of the four townships. Fifty-two surveys were returned from residents living within the village of Ubly with an additional 62 surveys being returned from residents residing outside the village limits but still within township #1 (n=114). Sixty surveys were returned from residents living within the village of Elkton with an additional 52 surveys being returned from residents residing outside the village limits but still within township #2 (n=112). Twenty-five surveys were returned from residents living within the village of Port Hope with an additional 66 surveys being returned from residents residing outside the village limits but still within township #3 (n=91). Ninety-two surveys were returned from residents living within the city of Harbor Beach with an additional 85 surveys being returned from residents residing outside the city limits but still within township #4 (n=177) (see Figure 1).



Three surveys had the written identification number colored over by black ink making it impossible to determine who had returned those specific surveys or what township they lived in. The survey response rates ranged from 46% in township #2 to 51% in townships 1 and 3 (see Table 8) ending with an overall response rate of 50%.

Township	Location	Total Primary Addresses	Number of Addresses Selected for Study	Total Number of Surveys Returned	Response Rate
Township #1	Inland	475	220	113	51%
Township #2	Inland	246	246	112	46%
Township #3	Coastal	177	177	91	51%
Township #4	Coastal	771	357	178	50%
Total		1.699	1.000	494*	50%

Table 8. Survey Response Rates by Township

\* Three surveys had the identification number marked out.

Respondents in two of the four studied townships had the opportunity to vote on allowing future development of wind farms in Huron County in November 2010. Only the residents under County Zoning (townships #1 and #3) living outside of village/city limits were allowed to vote on Proposal 10-03 and 10-04 on November 2, 2010. Proposal 10-03 regarded allowing

construction of wind farms in Bloomfield, Rubicon and Sigel Townships. Proposal 10-04 regarded allowing construction of wind farms in McKinley Township. Townships #1 and #3 had over a 42% voting turnout with both proposal 3 and 4 passing by majority vote (see Table 9).

		With Wind Farms		Without W	ind Farms
		<i>Twp #1</i>	<i>Twp #2</i>	<i>Twp #3</i>	<i>Twp #4</i>
Registered Voters <sup>a</sup>		1256	1088	562	961
Voter Turnout		602	460	341	493
Percentage		47.9%	42.3%	60.7%	51.3%
	In Favor	54.4%		52.6%	
Proposal 3 <sup>b</sup>	Oppose	40.1%		45.5%	
	n	329		211	
	In Favor	52.9%		52.1%	
Proposal 4 <sup>b</sup>	Oppose	41.2%		43.1%	
	n	329		211	

Table 9. Registered Voters and Voting Behavior

Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach

<sup>a</sup>Includes all registered voters within the designated townships

<sup>b</sup>Only the residents under County Zoning (Twp #1 & Twp #3) living outside of village/city limits were allowed to vote on Proposal 10-03 and 10-04 on November 2, 2010. Percentages not equaling 100% take into account those individuals who did not vote on the specific proposals.

Townships #2 and #4 were allowed to vote on all other agenda items. Countywide, the proposals passed with a 2/3 majority vote. When comparing actual voting results to survey results, survey responses indicated a greater percentage of opposition than the actual proposal voting results (see Table 10). The question on the survey asked if the respondent would support wind farm development at any location (public land, farm land, etc.) within Huron County. Only those respondents from townships #1 and #3 who lived outside of village limits were included in the comparison table 10. Fifty-nine out of the 62 respondents in township #1 and 62 out of the 66 respondents in township #3 responded to this question.

Dependent Variable		With Wind Farms		Without Wind Farms	
		Twp #1		<i>Twp #3</i>	
		Survey	Proposals <sup>a</sup>	Survey	<i>Proposals</i> <sup>a</sup>
Support of	In Favor	49.2%	53.7%	50.0%	52.4%
development	Oppose	50.8%	40.7%	50.0%	44.3%
	n	59	329	62	211

Table 10. Comparison of Voters and Survey Respondents on Support of Development

*Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach* 

<sup>a</sup>Includes all registered voters within the designated township voting on Proposals 10-03 and 10-04. Only the residents under County Zoning (Twp #1 & Twp #3) living <u>outside</u> of village/city limits were allowed to vote on Proposal 10-03 and 10-04 on November 2, 2010. Percentages not equaling 100% take into account those individuals who did not vote on the specific proposals. This table reflects a comparison of survey respondents outside of city limits and those who were allowed to vote in the selected townships.

Survey participants and November 2010 registered voters are similar in regards to gender

composition and age distribution (see Table 11).

	With Wind Farms								
	Twp	o #1	Ти	<i>p #2</i>					
	Voted on $\frac{11}{2}/10$ ( <i>n</i> =602) <sup>a</sup>	Survey Respondent (n=112)	Voted on $\frac{11}{2}$ /10 ( <i>n</i> =460) <sup>a</sup>	Survey Respondent (n=111)					
Gender									
Male	47.9%	55.0%	47.5%	47.1%					
Female	52.1%	45.0%	52.5%	52.9%					
Age									
18-21	1.3%	0.0%	1.1%	0.0%					
22-30	7.5%	5.4%	7.6%	2.7%					
31-40	11.1%	10.7%	11.9%	10.8%					
41-50	21.4%	24.0%	16.3%	15.3%					
51-59	18.9%	29.4%	21.5%	13.8%					
60+	39.8%	30.5%	41.6%	57.4%					

Table 11. Gender and Age Comparison of Registered Voters and Survey Respondents

Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach

<sup>a</sup>*Reflects those who voted in the November 2, 2010 election – regardless if they were allowed to vote on the proposals or not.* 

	Without Wind Farms								
	Tw	<i>p #3</i>	Twp #4						
	Voted on $\frac{11}{2}/10$ ( <i>n</i> =341) <sup>a</sup>	Survey Respondent (n=89)	Voted on $\frac{11}{2}$ ( <i>n</i> =493) <sup>a</sup>	Survey Respondent (n=176)					
Gender									
Male	51.3%	50.8%	47.5%	54.8%					
Female	48.7%	49.2%	52.5%	45.2%					
Age									
18-21	1.2%	0.0%	1.1%	0.0%					
22-30	4.8%	1.1%	5.6%	3.6%					
31-40	6.8%	8.8%	9.6%	10.0%					
41-50	12.8%	20.2%	13.6%	13.9%					
51-59	17.2%	15.3%	20.0%	37.1%					
60+	57.2%	54.6%	50.1%	35.4%					

Table 11 (cont'd). Gender and Age Comparison of Registered Voters and Survey Respondents<sup>a</sup>

*Twp* #1 = Bingham, *Twp* #2 = Oliver, *Twp* #3 = Rubicon, *Twp* #4 = Sand Beach

<sup>a</sup>*Reflects those who voted in the November 2, 2010 election – regardless if they were allowed to vote on the proposals or not.* 

#### Additional Comments on Survey

Space was intentionally left at the end of the survey which asked for and allowed survey participants to write any additional comments they would like to share. A total of 241 respondents, or 48.5% of all respondents, provided comments. These additional comments were

not analyzed in this study but are inserted in Appendix D for reference.

#### Hypothesis Testing

The following pages will entail a detailed look at data analysis results.

### **Research Question 1**

The first research question asked about the relationship between proximity of a residence from a wind farm and perceptions and support of wind farm development. Three questions in the survey related to distance from wind turbines; (q1, q3 and q7), four questions addressed perception (q5, q9, q10 and q11) while two questions related to support (q12 and q13).

An initial analysis utilized both one-way ANOVA and chi-square test of each individual question to identify significant associations in responses between township samples and geography measures (see Appendix C – Table 1a). The first survey question asked about the location of the survey participant's residency. A chi-square test revealed that survey respondents in township #2 were more likely to live within village limits than townships #1, #2 or #4 (p<.01). Survey respondents in township #1 were more likely to live outside of village limits in the country than townships #2, #3 or #4 (p<.001), while those survey respondents living in township #3 were most likely to live outside of village limits along or near the Lake Huron coastline (p<.001).

A question asked about the distance in miles that the respondent lived to the nearest wind turbine. A one-way ANOVA was used to determine that there was a significant difference between those who lived in townships with wind farms and those who did not (see Table 3a). Respondents in township #3 lived the furthest away (mean miles of 20.38) and those who lived in township #1 lived the closest to wind turbines (mean miles of .82), p<.001. In validating participants' responses, the survey responses were split up into two categories: those that lived in a township adjacent/containing turbines and those that lived in nonadjacent/comparison townships. Each township is a six mile by six mile section respectively. Using a Huron County Township map, the farthest a resident in township #3 is from a turbine in township #2 is approximately 26 miles while that resident would be approximately 14 miles from a turbine in township #1. The farthest a resident living in township #4 would be from a turbine in township #2 is approximately 30 miles while that same resident would only approximately 13 miles from a turbine in turbine in township #1. Each survey respondent within township #1 and township #2 should have listed a maximum of 6 miles away for a turbine since they are within a six by six mile

section. Correspondingly, residents living within township #3 and township #4 should have written that they lived 6 miles or greater to the nearest turbine.

A cross tab of distance across townships and the information provided above indicate that the division between those who would be considered living 'adjacent' or 'not adjacent' to turbines would occur between the 6 and 7 mile marker. Of the 467 survey respondents who answered this question (30 didn't answer), 210 surveys out of the 225 surveys returned from township #1 and township #2 indicated that they lived six miles or closer to a turbine while 261 surveys out of the 269 surveys returned from township #3 and township #4 indicated that they lived greater than 6 miles from the closest turbine. The following indicate the responses that are highly unlikely: one survey from township #2 indicated that they lived .5 miles away, one survey from township #3 and 4 miles, one survey from township #4 indicated that they lived one mile away, two surveys from township #4 indicated that they lived one mile away, two surveys from township #4 indicated that they lived 3 miles away, two surveys from township #4 indicated that they lived 5 miles away and one survey from township #4 indicated that they lived 5 miles away and one survey from township #4 indicated that they lived 5 miles away and one survey from township #4 indicated that they lived 5 miles away and one survey from township #4 indicated that they lived 6 miles from the nearest turbine. Overall, a small percentage of respondents misrepresented the distance they lived from a turbine.

Next, respondents were asked about the frequency and location of seeing wind turbines using a five point Likert-type scale (1 = never, to 5 = everyday). In all cases, the respondents who reside within a township with wind farms (township #1 or #2) see wind turbines more frequently when at home, when driving, when in the countryside, when in town and when along the coastline than those who do not live within a township with wind farms, p<.001(Table 7a). Analyzing question 1, 3 and 7 collectively, the two townships with wind farms (township #1 and #2) and the two townships without wind farms (township #3 and #4) were deemed sufficiently similar to each other to be compared within subsequent analyses.

Four questions in the survey related to wind farm perception; question 5, 9, 10 and 11. Question 5 and 9 asked about perceptions held about wind farms both 'before' the wind farms were constructed and 'now' that the wind farms exist (Table 5a). There was not a significant difference in perception across all four townships 'before' the wind farms were developed. There was, however a significant difference between townships #1 & #2 and townships #2 & #3 'now' that the wind farms have been constructed, p<.01. Survey respondents in township #2 were significantly more positive in their perceptions than respondents in township #1 or #3. There was a significant difference in the change in perception from 'before' to 'now' between townships #1 & #2 and townships #2 & #3, p<.001. On average, survey respondents' perceptions in three out of the four townships (township #1, #3 and #4) became more negative over time, while the perceptions of survey respondents in township #2 became more positive over time (see Appendix C, Table 5a).

A question asked about level of agreement of whether wind turbines symbolize a sign of progress in the modern energy crisis (Table 9a). A significant difference was found in the means between those respondents in townships #2 and #3. Township #2 held stronger beliefs that wind turbines symbolize progress than all other townships. Question 11 asked about the level of agreement of whether wind energy is beneficial to have in Huron County (Table 10a). A significant difference was found to exist between townships #1 & #2 and townships #2 & #3, p<.001. Survey respondents in township #2 held the highest level of agreement amongst all four townships.

Two questions within the survey related to level of support of wind farms; question 12 and question 13. Question 12 asked about the level of support for development of wind farms on different locations within Michigan (Table 11a). ANOVA determined that there was not a significant difference in level of support on the sections 'don't support' (p>.05), 'on public land' (p>.05), 'on the coast of Huron County' (p>.05), 'off the coast of Huron County' (p>.05) and 'within Michigan' (p<.05 –however there was no significant mean group difference). On three of the items there was a significant difference in responses between townships #1 and #2; 'on my property' (p<.05), 'on farmland' (p<.01) and 'within Huron County' (p<.01). There was a greater number of significant differences in the section asking about level of support 'within sight of my property' (p<.001) where survey respondents in township #2 were significantly more favorable to support turbines within sight of their property than respondents in townships #1, #3 or #4. In analysis of question 13, a chi-square test revealed that respondents in township #2 were more supportive of wind farm development than respondents in all three other townships (Table 12a).

Next, an independent samples t-test analysis was utilized to further test the relationship between proximity and support of wind farms within Huron County. Each survey respondent was coded into either living within one mile from a wind turbine or greater one mile. The independent samples t-test revealed that there was no significant difference between respondents' support in townships #1, t = .341, p>.05 and township #2, t = -.832, p>.05 and the proximity to a wind turbine (Table 12).

Next, an independent samples t-test was utilized to further test proximity (living within one mile of a wind turbine or greater than one mile) and perception of wind farms. The analysis revealed no significant differences: township #1 'Before' perception, t =1.824, p>.05; township #1 'Now' perception, t = 1.235, p>.05; township #2 'Before' perception, t = -.467, p>.05; and township #2 'Now' perception, t = .361, p>.05 (Table 13).

Table 12. Independent samples t-test measuring proximity w/in 1 mile of wind turbine vs
support of wind farms w/in Huron County

Independent Variable	With Wind Farms							
		Twp #1			<i>Twp #2</i>			
Proximity	Ν	Mean <sup>a</sup>	SD	N	Mean <sup>a</sup>	SD		
W/in 1 mile	89	.33	1.36	49	1.0	1.04		
Over 1 mile	18	.44	1.29	50	.84	.87		
b t		.34	83					

*Twp* #1 = *Bingham*, *Twp* #2 = *Oliver* 

<sup>*a*</sup>*Five point scale from (-2) strongly disagree, to (2) strongly agree.* 

<sup>b</sup>No significant differences were revealed. \*p<.05, \*\*p<.01, \*\*\*p<.001

Table 13. Independent samples t-test measuring proximity w/in 1 mile of wind turbine vs. the BEFORE and NOW perception of wind farms

Dependent	it With Wind Farms											
Variable			Twp	#1					Twp	#2		
		Before			Now			Before		Now		
Proximity	Ν	Mean <sup>a</sup>	SD	N	Mean <sup>a</sup>	SD	N	Mean <sup>a</sup>	SD	N	Mean <sup>a</sup>	SD
W/in 1 mile	85	.46	1.24	90	.19	1.50	45	.71	.92	50	.82	1.08
Over 1 mile	16	1.06	1.06	18	.67	1.50	41	.61	1.09	49	.90	1.07
b t		1.82			1.24			47			.70	

Twp #1 = Bingham, Twp #2 = Oliver

<sup>*a*</sup>*Five point scale from (-2) very negative, to (2) very positive.* 

<sup>b</sup>No significant differences were revealed. \*p<.05, \*\* p<.01, \*\*\*p<.001

Table 14 indicates the amount of change and the directionality of the change in mean

perceptions over time. Township #2 was the only township in which the respondents'

perceptions became more positive.

Table 14. Perceptions of turbines 'Before' wind farm development and 'Now' that wind turbines exist

	With Wind Farms Without Wind Fa					
Dependent	<i>Twp #1</i>	<i>Twp #2</i>	<i>Twp #3</i>	<i>Twp #4</i>		Group
Variable	Mean <sup>a</sup>	Mean <sup>a</sup>	Mean <sup>a</sup>	Mean <sup>a</sup>	F Test	Comparison
Before	3.55	3.63	3.57	3.72	.64	n.s.
Now	3.31	3.84	3.19	3.58	5.13**	2>1, 3
Difference	20	.20	43	14	5.73***	2>1, 3

Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach

<sup>*a*</sup>Five-point scales from (1) very negative, to (5) very positive. \*p<.05, \*\*p<.01, \*\*\*p<.001

The majority of respondents who did not change perceptions regarding wind farms over

time held a range of mostly neutral, positive or very positive perception (Table 15).

Table 15. Number of Individuals per Township whose perceptions did not change after the wind farms were built

	With Wi	nd Farms	Without Wind Farms			
	<i>Twp #1</i>	<i>Twp #2</i>	<i>Twp #3</i>	<i>Twp #4</i>		
Very Negative	7	3	3	8		
Negative	2	3	1	3		
Neutral	8	7	8	17		
Positive	13	21	13	27		
Very Positive	23	13	8	27		
Total	53	47	33	82		

*Twp* #1 = Bingham, *Twp* #2 = Oliver, *Twp* #3 = Rubicon, *Twp* #4 = Sand Beach

In sum, the hypothesis, "Proximity of residence to wind farms does influence perceptions and support of wind farm development" is partly accepted. Residents of township #2 held the most positive perceptions and the greatest level of support of wind farm development than the other three townships. Respondents in townships #3 and #4 (without wind farms) were similar to each other in their perceptions and support of wind farm development. Residents of townships #1 and #2 (with wind farms) differed on their perceptions and support of wind farm development. The second research question asked if the level of attendance of wind zoning meetings in the planning process of wind farms influenced the perception and support for wind farm development. Independent samples t-tests revealed that those who attended meetings considered themselves to be more knowledgeable about renewable energy, wind energy and sustainable development than those who did not attend meetings (Table 16).

To further test the hypothesis of any association between the variables knowledge of wind energy, perceptions of wind farms 'before' development and perception 'now' (after development), each variable was analyzed utilizing correlation (Table 17), as well as conducting analysis on the relationship between knowledge of wind energy and level of support within Huron County (Table 18). No significant findings were observed in any of the results.

Dependent Variable	Independent Variable	With Wind Farms						
How knowledgeable	Have you							
are vou about a	attended							
	meetings?		<i>Twp</i> #1		<i>Twp #2</i>			
		N	Mean	SD	N	Mean	SD	
Renewable energy	No	62	2.34	.77	83	2.23	.85	
	Yes	48	3.10	.79	24	2.79	.88	
T Test			26.60***			8.08**		
Wind energy	No	63	2.33	.78	86	2.33	.82	
	Yes	48	3.27	.77	24	3.00	.93	
T Test			39.86***			11.99**		
Sustainable	No	61	2.05	.87	80	1.94	.99	
development	Yes	45	2.56	1.03	23	2.57	.84	
T Test			7.51**			7.70**		

Table 16. One-Way ANOVA for examining differences in knowledge and meeting attendance

*Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach* 

<sup>*a*</sup> Five-point scales from (1) not at all knowledgeable, to (5) extremely knowledgeable. \*p<.05, \*\*p<.01, \*\*\*p<.001

Table 16 (cont'd). One-Way ANOVA for examining differences in knowledge and meeting
attendance

Dependent	Independent			7.4				
Variable	Variable	Without Wind Farms						
How knowledgeable	Have you							
are vou about <sup>a</sup>	attended							
	meetings?	<i>Twp #3</i>				Twp #4		
		N	Mean	SD	N	Mean	SD	
Renewable energy	No	57	2.40	.84	144	2.43	.92	
	Yes	29	2.83	.97	29	3.00	.85	
T Test			4.41*			9.47**		
Wind energy	No	58	2.41	.82	143	2.47	.92	
	Yes	29	2.97	.98	28	3.04	.88	
T Test			7.69**			9.06**		
Sustainable	No	57	1.89	.82	140	1.97	.98	
development	Yes	28	2.75	1.01	28	2.79	.96	
T Test			17.64***			16.19***		

Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach <sup>a</sup>Five-point scales from (1) not at all knowledgeable, to (5) extremely knowledgeable. \*p<.05, \*\*p<.01, \*\*\*p<.001

Table 17. Correlation between knowledge of wind energy and the before and now perception of wind farms

		With Wind Farms						
IV	DV	Twp	#1	<i>Twp #2</i>				
How knowledge-			Partial		Partial			
able are you	Perception of		(control for		(control for			
about	Wind Farms	<b>Bi-variate</b>	mtg. att.)	<b>Bi-variate</b>	mtg. att.)			
		Corr.	Corr.	Corr.	Corr.			
Wind Energy <sup>a</sup>	BEFORE	.07	.12	.09	.10			
	NOW	07	.23	04	01			

Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach <sup>a</sup>No significant differences were revealed.

# Table 17 (cont'd). Correlation between knowledge of wind energy and the before and now perception of wind farms

		Without Wind Farms						
IV	DV	Тw	vp #3	<i>Twp #4</i>				
How knowledge-			Partial		Partial			
able are you	Perception of		(control for		(control for			
about	Wind Farms	<b>Bi-variate</b>	mtg. att.)	Bi-variate	mtg. att.)			
		Corr.	Corr.	Corr.	Corr.			
Wind Energy <sup>a</sup>	BEFORE	11	14	.10	.10			
	NOW	21	18	02	10			

Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach <sup>a</sup>No significant differences were revealed.

# Table 18. Correlation between knowledge of wind energy and level of support of wind farms within Huron County

		With Wind Farms					
IV	DV	Ти	vp #1	<i>Twp #2</i>			
How knowledge-	Level of	Bi-variate	Partial	Bi-variate	Partial		
able are you about	support w/in		(control for		(control for		
			mtg. att.)		mtg. att.)		
		Corr.	Corr.	Corr.	Corr.		
Wind Energy <sup>a</sup>	Huron	07	02	.08	.10		
	County						

Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach <sup>a</sup>No significant differences were revealed.

Table 18 (cont'd). Correlation between knowledge of wind energy and level of support of wind farms within Huron County

		Without Wind Farms					
IV	DV	<i>Twp #3</i>		<i>Twp #4</i>			
How knowledge-	Level of	Bi-variate	Partial	Bi-variate	Partial		
able are you about	support w/in		(control for		(control for		
			mtg. att.)		mtg. att.)		
		Corr.	Corr.	Corr.	Corr.		
Wind Energy <sup>a</sup>	Huron	21	15	.03	.03		
Wind Energy	County						

*Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach* 

<sup>a</sup>No significant differences were revealed.

An independent samples t-test between attendance of meetings and perceptions ('before' and 'now') (Table 19) along with attendance of meetings and support of wind farms within Huron County (Table 20) revealed no significant difference across townships. The independent samples t-tests and correlations revealed no association existed between knowledge of wind farms and perception or support of wind farms. In sum, the hypothesis that knowledge of wind farms is related to perception and support of wind energy development was not supported.

 Table 19. Independent Samples T-Test between attendance of meetings and before and now perception of wind farms

DV	IV	٢	With Wi	nd Farm	S	W	ithout W	Vind Farms	
Perception	Meeting								
of Wind	attendance								
Farms		Twp	o #1	Twp	<i>p</i> #2	Twp	o #3	Twp	o #4
		n	Mean <sup>a</sup>	п	Mean <sup>a</sup>	п	Mean <sup>a</sup>	n	Mean <sup>a</sup>
	No	58	.62	69	.64	50	.60	130	.77
BEFORE	Yes	47	.47	22	.59	28	.50	29	.55
	t <sup>b</sup>	.6	54	.1	.9	.4	3	.9	9
	No	63	.46	82	.93	56	.36	129	.64
NOW	Yes	49	.12	24	.54	29	14	29	.38
	t b	1.	18	1.	35	1.	63	1.	02

Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach <sup>a</sup>Five-point scale from (1) very negative, to (5) very positive.

<sup>b</sup>No significant differences were revealed.

 Table 20. Independent Samples T-Test between attendance of meetings and support of wind farms in Huron County

DV	IV	With Wind Farms				Without Wind Farms			
	Meeting								
	attendance	Twp	o #1	Twp	p #2	Twp	p #3	Twp	o #4
		п	Mean <sup>a</sup>	п	Mean <sup>a</sup>	n	Mean <sup>a</sup>	n	Mean <sup>a</sup>
Support	No	63	.49	84	.92	58	.72	144	.56
w/in	Yes	48	.23	23	.78	30	03	29	.48
H.C.	t	1.03		.58		2.82**		.346	

*Twp* #1 = Bingham, *Twp* #2 = Oliver, *Twp* #3 = Rubicon, *Twp* #4 = Sand Beach

<sup>*a*</sup> Five-point scale from (-2) strongly disagree, to (2) strongly agree. \*p<.05, \*\*p<.01, \*\*\*p<.001 The third research question asked whether land ownership affects perception and support of wind energy development. A number of tests were conducted to test whether there were relationships between the variables of residency, acres owned, perception ('before' and 'now') and support of wind farms within Huron County. A Chi-Square test revealed that no significant difference existed between the variables of respondent residency (village, p>.05 or rural, p>.05) and acres owned (Table 21).

An independent samples t-test revealed that no significant difference existed between residents who lived in rural areas or within village limits and their 'before' and 'now' perceptions (Table 22). An independent samples t-test also revealed that no significant difference existed between residents who lived in rural areas or within village limits and their support of wind farms within Huron County (Table 23). While not significantly different, this test indicated that the overall mean of support was higher within respondents of village limits than rural areas.

Variable	Variable	With Wind Farms		Without W	ind Farms	
Residency	Number of	<i>Twp #1</i>	<i>Twp #2</i>	<i>Twp #3</i>	<i>Twp #4</i>	Chi-
<i>Location</i> <sup>a</sup>	Acres Owned	(n=61)	( <i>n</i> =43)	( <i>n</i> =58)	(n=73)	Square <sup>b</sup>
	Less than 1	6.6%	4.7%	12.1%	16.4%	
	acre					
	At least 1 but	27.9%	39.5%	32.8%	31.5%	
Rural Resident	less than 3					10.86
	At least 3 but	41.1%	23.3%	29.3%	23.3%	
	less than 20					
	20+	24.6%	32.6%	25.9%	28.8%	

Table 21. Chi-Square - Residency Location and Acres Owned

		Twp #1	<i>Twp #2</i>	<i>Twp #3</i>	<i>Twp #4</i>	
		( <i>n</i> =25)	( <i>n</i> =22)	(n=13)	( <i>n</i> =40)	
	Less than 1	36.0%	31.8%	23.1%	42.5%	
Village	acre					
	At least 1 but	32.0%	31.8%	30.8%	42.5%	
	less than 3					7.94
Resident	At least 3 but	12.0%	13.6%	15.4%	10.0%	
	less than 20					
	20+	20.0%	22.7%	30.8%	5.0%	

Table 21(cont'd). Chi-Square – Residency Location and Acres Owned

Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach a = 335

<sup>b</sup> No significant associations were revealed. \*p<.05, \*\* p<.01, \*\*\*p<.001

 Table 22. Independent Samples T-Test between residency location and BEFORE and NOW perceptions of wind farms

DV	IV	With Wind Farms					
Perception of Wind	Residency		<i>Twp</i> #1		<i>Twp</i> #2		
Farms <sup>a</sup>	Location	Ν	Mean	SD	Ν	Mean	SD
	Rural	60	.42	1.23	43	.74	.90
BEFORE	Village	45	.73	1.18	47	.57	1.02
	T Test <sup>b</sup>		-1.33			.84	
	Rural	64	.16	1.56	49	.84	1.01
NOW	Village	48	.52	1.41	55	.93	1.07
	T Test <sup>b</sup>		-1.28			44	

*Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach* 

<sup>*a*</sup>*Five-point scale from* (-2) *very negative to* (2) *very positive.* 

<sup>b</sup>No significant differences were revealed. \*p<.05, \*\* p<.01, \*\*\*p<.001 Table 22 (cont'd). Independent Samples T-Test between residency location and BEFORE and NOW perception of wind farms

DV	IV	Without Wind Farms					
Daraantion of	Pasidanay	<i>Twp #3</i>			Twp #4		
Wind Farm <sup>a</sup>	Logation	λ7	a	CD	λī	a	CD
wina rarm	Location	IN	Mean	SD	IN	Mean	SD
	Rural	56	.59	.97	84	.57	1.24
BEFORE	Village	21	.48	1.03	76	.88	.89
221 0112	T Test <sup>b</sup>		.45			-1.83	
NOW	Rural	60	.08	1.38	82	.41	1.34
	Village	21	.50	1.14	78	.73	1.09
	T Test <sup>b</sup>		-1.31		-1.64		

Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach <sup>a</sup>Five-point scale from (-2) very negative to (2) very positive.

<sup>b</sup>No significant differences were revealed.

\**p*<.05, \*\**p*<.01, \*\*\**p*<.001

Table 23. Independent Samples T-Test between residency location and support of wind farms in
Huron County

DV	IV		With Wind Farms					
	Residency		<i>Twp #1</i>			<i>Twp #2</i>		
	Location	Ν	Mean <sup>a</sup>	SD	Ν	Mean <sup>a</sup>	SD	
Commont	Rural	63	.22	1.39	51	.69	1.01	
Support	Village	48	.58	1.25	55	1.05	.91	
w/ш п.С.	T Test <sup>b</sup>		-1.42		-1.97			

*Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach* 

<sup>a</sup>*Five-point scale from* (-2) *strongly disagree to* (2) *strongly agree.* 

<sup>b</sup>No significant differences were revealed.

\**p*<.05, \*\**p*<.01, \*\*\**p*<.001

 Table 23 (cont'd). Independent Samples T-Test between residency location and support of wind farms in Huron County

DV	IV	Without Wind Farms					
	Residency	<i>Twp #3</i>			Twp #4		
	Location	Ν	Mean <sup>a</sup>	SD	N	Mean <sup>a</sup>	SD
Support	Rural	63	.41	1.27	86	.41	1.23
w/in	Village	21	.67	1.09	89	.65	1.02
H.C. <sup>b</sup>	T Test <sup>b</sup>		87			-1.43	

Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach <sup>a</sup> Five-point scale from (-2) strongly disagree to (2) strongly agree. <sup>b</sup> No significant differences were revealed. \*p<.05, \*\*p<.01, \*\*\*p<.001

A one-way ANOVA revealed that there were no significant differences between the number of acres owned and the perceptions held by residents (Table 24) or in their level of support for wind farms within Huron County (Table 25) across the four categories of land ownership (less than 1 acre, at least 1 but less than 3 acres, at least 3 but less than 20 acres and more than 20 acres). In sum, the number of acres owned does not appear to be a predictor of perception or support of wind farms within Huron County.

Table 24. ANOVA - Acres owned and BEFORE and NOW	perception of wind farms
--	--------------------------

Variable	Variable	With Wind Farms				Without Wind Farms			
Perception <sup>a</sup>	Number of Acres								
rereeptien	Owned	<i>Twp #1</i>		<i>Twp #2</i>		<i>Twp #3</i>		<i>Twp #4</i>	
		Ν	Mean <sup>a</sup>	N	Mean <sup>a</sup>	Ν	Mean <sup>a</sup>	Ν	Mean <sup>a</sup>
BEFORE	Less than 1 acre	12	.33	7	.29	8	.63	24	1.21
	At least 1 but	25	.72	20	.55	20	.70	38	.79
	less than 3								
	At least 3 but	25	.60	13	.38	18	.39	22	.41
	less than 20								
	20+	18	.28	16	.81	18	.78	23	.43
	F	.62		.65		.52		2.85*	
	Group	n.s.		n.s.		n.s.		n.s.	
	Comparisons								

Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach <sup>a</sup> Five-point scale from (-2) very negative to (2) very positive. \*p<.05, \*\*p<.01, \*\*\*p<.001

NOW	Less than 1 acre	13	.00	9	1.11	9	.78	25	.96
	At least 1 but	25	.48	25	.72	22	.27	37	.59
	less than 3								
	At least 3 but	28	.25	13	.23	19	11	22	.41
	less than 20								
	20+	20	15	17	.82	20	.20	23	.30
	F	1.66		1.18		.83		1.36	
	Group	n.s.		n.s.		n.s.		n.s.	
	Comparisons								

Table 24 (cont'd) ANOVA – Acres owned and BEFORE and NOW perception of wind farms

Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach <sup>a</sup> Five-point scale from (-2) very negative to (2) very positive. \*p<.05, \*\*p<.01, \*\*\*p<.001

Table 25. ANOVA – Acres	owned and support	of wind farms w	v/in Huron County
	1 1		2

Variable	Variable		With Wi	nd Fa	rms	Without Wind Farms				
	Number of	Twp #1		<i>Twp #2</i>		Twp #3		<i>Twp #4</i>		
	Acres									
	Owned									
		Ν	Mean <sup>a</sup>	Ν	Mean <sup>a</sup>	Ν	Mean <sup>a</sup>	Ν	Mean <sup>a</sup>	
	Less than 1	13	.15	9	.78	9	1.33	29	.72	
Support of wind farms w/in Huron County	acre									
	At least 1	24	.42	25	1.04	24	.21	40	.38	
	but less than									
	3									
	At least 3	28	.21	12	.08	19	.42	22	.32	
	but less than									
	20									
	20+	20	.25	19	.79	20	.35	23	.57	
	F	.14		2.15		1.86		.69		
	Group		n.s.		n.s.		n.s.		n.s.	
	Comparisons									

Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach <sup>a</sup> Five-point scale from (-2) strongly disagree to (2) strongly agree. \*p<.05, \*\*p<.01, \*\*\*p<.001

# **Research Question 4**

Research Question 4 asked about belief outcomes that contribute to perception of wind farm development. This question tested whether environmental, social or economic components were stronger or more influential than each other toward perception and support of wind farms
using regression analysis. The choices for survey question 8, "There are many positive, neutral or negative issues related to wind energy. How much do you agree or disagree or are you neutral with the following statements?" was divided into three categories (economic, environmental and social) (Table 26).

Environmental	Social	Economic
<ul> <li>Allows land to be reverted to its natural state</li> <li>Allows multiple land uses</li> <li>*Has an uncertain or unproven impact on the environment</li> <li>*Is a danger to wildlife</li> <li>Is a clean energy source</li> <li>Is a renewable resource (limitless)</li> </ul>	<ul> <li>*Creates a disturbing noise from turbines</li> <li>Is an attractive feature on the landscape</li> <li>*Requires too many number of turbines</li> <li>Indicates a willingness of the community to be part of an innovation</li> <li>Brings renewed interest to the area</li> <li>Is a safe energy source</li> <li>*Creates a strobe/flicker affect from turbine blades</li> <li>*Brings general unwanted change to the community</li> <li>*Is hazardous to people's health</li> <li>*Has an uncertain or unproven impact on people</li> </ul>	<ul> <li>Increases property value</li> <li>*Is an unreliable output of electricity (not always windy)</li> <li>*Has an uncertain or unproven impact on the economy</li> <li>Brings money and other economic benefits to the communities in which they are sited</li> <li>Creates tourism (non-residents are interested in seeing</li> </ul>

TABLE 26. Survey Belief Outcomes Regarding Wind Energy

\*Items were reverse coded for analysis.

Survey respondents were asked to rate their level of agreement with 21 belief outcomes on a five point Likert scale from 'strongly disagree' to 'strongly agree.' The belief outcomes per environmental, social and economic category were averaged in order to use one number in the linear regression analysis. Linear regression indicated that three (townships #1, #3 and #4) out of four townships showed that there was a stronger effect of social belief outcomes on support

for wind farms – standardized beta ( $\beta$ )=.40 (township #1); ( $\beta$ )=.60 (township #3); ( $\beta$ )=.48 (township #4) – compared to the affects of economic or environmental belief outcomes (Table 27). The findings from all four townships revealed that economic belief outcomes were not as significant as environmental or social belief outcomes in predicting support for wind farms within Huron County.

 

 Table 27. Regression analysis for the prediction of support for wind farms from economic, environmental and social beliefs related to wind farms

	With Wind Farms					Without Wind Farms						
		Twp #1	!	<i>Twp #2</i>		Twp #3		Twp #4		4		
Belief	(	(n=111)		(	( <i>n</i> =105)		(n=89)		( <i>n</i> =176)			
Components	β	t	р	β	t	р	β	t	р	β	t	р
Economic	.14	1.02	n.s.	.09	.53	n.s.	.02	.15	n.s.	.03	.35	n.s.
Environmental	.28	2.21	<.05	.18	1.12	n.s.	.00	02	n.s.	.29	3.38	<.01
Social	.40	2.51	<.05	.21	1.14	n.s.	.60	3.21	<.01	.48	4.21	<.001
	F=57.4, p<.001		F=6.6, p<.001		F=17.8, p<.001		F=80.18, p<.001					
	Adju	sted R <sup>2</sup>	$^{2}$ =.61	Adju	Adjusted $R^2 = .18$		Adjusted $R^2 = .36$			Adjusted $R^2 = .58$		

*Twp* #1 = *Bingham*, *Twp* #2 = *Oliver*, *Twp* #3 = *Rubicon*, *Twp* #4 = *Sand Beach* 

Table 28. Regression analysis for the prediction of perception of wind farms BEFORE development from economic, environmental and social beliefs related to wind farms

	With Wind Farms						Without Wind Farms					
		Twp #1	!		Twp #2	2	<i>Twp #3</i>			<i>Twp #4</i>		
Belief	(	n=105	)		(n=90)	)		(n=79)		(n=161)		
Components	β	t	р	β	t	р	β	t	р	β	t	р
Economic	.38	2.38	<.05	01	08	n.s.	14	79	n.s.	.02	.16	n.s.
Environmental	.11	.76	n.s.	.38	2.50	<.05	.49	2.96	<.01	.10	.94	n.s.
Social	.24	1.30	n.s.	.34	1.91	n.s.	.27	1.33	n.s.	.61	4.53	<.001
	F=3	2.3, p<	.001	F=24.4, p<.001		F=15.2, p<.001		F=51.38, p<.001				
	Adju	sted R <sup>2</sup>	$^{2}$ =.47	Adju	sted R <sup>2</sup>	$^{2}$ =.44	Adjusted $R^2 = .35$			Adjusted $R^2 = .49$		

*Twp* #1 = Bingham, *Twp* #2 = Oliver, *Twp* #3 = Rubicon, *Twp* #4 = Sand Beach

Linear regression revealed that in two (townships #2 and #3) of the four townships there was a stronger affect of environmental belief outcomes on the perception held 'before' wind farms were developed – standardized beta ( $\beta$ )=.38 (township #2); ( $\beta$ )=.49 (township #3) – compared to the effects of economic or social belief outcomes (Table 28). Linear regression

revealed that the four townships showed a stronger affect of social belief outcomes on the perception held 'now' that wind farms are developed – standardized beta ( $\beta$ )=.52 (township #1); ( $\beta$ )=.44 (township #2); ( $\beta$ )=.47 (township #3); ( $\beta$ )=.56 (township #4) – compared to the effects of economic or environmental belief outcomes (Table 29).

Table 29. Regression analysis for the prediction of perception of wind farms NOW that development has occurred from economic, environmental and social beliefs related to wind farms

	With Wind Farms					Without Wind Farms						
		Twp #	41		Twp #2	2	<i>Twp #3</i>		3	<i>Twp #4</i>		
Belief		(n=112)		(	( <i>n</i> =103)		(n=86)		( <i>n</i> =161)			
Components	β	t	р	β	t	р	β	t	р	β	t	р
Economic	.31	3.25	<.01	.17	1.37	n.s.	.28	2.84	<.01	.32	4.57	<.001
Environmental	.11	1.25	n.s.	.25	2.24	<.05	.20	2.25	<.05	.06	1.01	n.s.
Social	.52	4.69	<.001	.44	3.40	<.01	.47	4.10	<.001	.56	6.84	<.001
	F=155.7, p<.001		F=60.2, p<.001		F=108.4, p<.001			F=234.4, p<.001				
	Adjı	usted R	$k^2 = .81$	Adju	Adjusted $R^2 = .64$		Adjusted $R^2 = .80$			Adjusted $R^2 = .81$		

*Twp* #1 = *Bingham*, *Twp* #2 = *Oliver*, *Twp* #3 = *Rubicon*, *Twp* #4 = *Sand Beach* 

In sum, the hypothesis that economic belief outcomes were the driving force of perception and support was not supported by the data. Social belief outcomes were the strongest predictor of support for wind development while both social and environmental belief outcomes were the strongest predictor of perceptions of wind farms.

#### Chapter 5

#### Summary, Conclusions, Discussion of Findings and Recommendations

### Summary

The focus of the research was to determine the factors influencing perceptions held by residents in four townships of Huron County, Michigan of wind energy development. Specifically, the study sought to answer whether proximity of a residence to a turbine, level of knowledge held about renewable energy, ownership of land or which belief outcome factor explained the perceptions and level of support held by township residents.

To study these topics and their relationships, a two-stage research design was used. The subjects of the study were 11 interviewees who were either landowners with a wind development contract and/or turbine, landowners without a contract, rural residents, village residents and community decision makers. In addition, 497 (50% response rate) residents from four townships in Huron County completed and returned a mail-survey. The data were collected during the summer and fall 2010 and winter 2011.

The interview data were analyzed using thematic coding. Survey data were analyzed using frequencies, contingency tables, chi-square tests, correlations, ANOVAs and the Scheffe's Test along with linear regression. The IBM SPSS Statistics, version 19, was used to analyze the data.

#### Findings

The analysis of the data revealed the following:

- 1. Some support existed for the hypothesis that proximity to a wind turbine negatively influenced perception and support for wind farms in Huron County.
- 2. The number of wind energy meetings attended was positively related to how knowledgeable meeting attendees felt about the topics of sustainable development, wind energy and renewable energy. However, no relationship was revealed between knowledge held by landowners of wind energy and level of perception or support of wind farms in Huron County.
- The amount of land owned did not have an influence on level of perception or support for wind farms in Huron County.
- Social and environmental belief outcomes were more strongly associated with perception and support of wind farms in Huron County than economic belief outcomes.

#### **Discussion of Findings**

Approximately six out of every ten survey respondents indicated that they would be willing to support wind farms at any location within Huron County; less than a quarter of all respondents indicated that they would not be willing to support wind farms at any location within Huron County. The majority of respondents indicated that they held a positive or very positive perception of wind farms before the wind farms were built, while approximately a quarter of all respondents felt neither negative or positive in their perceptions regarding wind farms before development. Analysis of perceptions after, or now, that wind farms have been constructed indicates that the majority of respondents stayed positive or very positive in their perceptions, yet those who indicated a negative or very negative perception nearly doubled. This suggests that those individuals who considered themselves as neutral before wind farms were constructed had formed mostly negative perceptions over the course of wind farm construction.

The significance of proximity to wind turbines influencing perception and support of wind farms is only partly supported. The wind farm boundaries in township #2 are in a complete square. This would signify that those residents living within the boundary were in agreement with wind farm development. The boundary lines for the wind farm in township #1 are more jagged and in the shape of an upside down 'u,' This would signify that less residents are in agreement of support of wind farm development. If residents were in support, the 'u' would be more in the shape of a square as in township #2 as landowners would have agreed to lease land for wind development. This 'u' shaped boundary allows for more residents to be either positively or negatively impacted by wind farm development as the boundary lines are longer than in township #2. Township #2 was consistently more favorable and more positive in their perceptions and support for wind farms. Initial analysis of perceptions and support revealed that there was a significant difference between respondents in townships #1 and #2. Subsequent analysis indicated that the perceptions and support of wind farms were not statistically significantly different when the respondents were separated into two groups - those living within one mile from a turbine and those living further than one mile. This suggests that a one mile distinction between groups is not an adequate distance in showing influence on the proximity of a residence to a wind turbine and perception and support. The differences in support and perceptions between townships #1 and #2 could be explained on the shape of the wind zone overlay (wind farm boundaries) itself. Looking within the wind farm boundaries for other explanations, a distinction in the number and type of wind turbines is apparent. Township #1 is larger of the two – utilizing 46 GE model 1.5 MW turbines, while Township #2 utilizes 32 Vestas model 1.65 MW turbines. The number of wind farms 'clustered' in one area, along with the size and model of turbines used may affect perceptions of wind farms.

Findings from this study are inconsistent with results from recent studies (Jones & Eiser, 2010; Swofford & Slattery, 2010) which indicated that an inverse relationship between proximity and positive attitudes exists; whereby public acceptance of wind development decreased the closer one located to the wind farm(s). Township #2 is in direct conflict from the results of these previous studies. Township #2 contains wind turbines and is consistently the most positive township in regards to support and perceptions. This difference between townships may also be explained through some of the interviews in which interviewees felt as if the wind farm development from start to finish was more transparent in township #2 than in township #1. Results from the present study support the view that the traditionally used term of NIMBY does not adequately explain attitudes of wind farms.

Findings from research question two suggested that the level of knowledge is not statistically significant in predicting support or perception of wind farms. Meeting attendance is associated with knowledge level however – greater meeting attendance is associated with a perceived higher level of knowledge of wind energy. This could be explained if knowledgeable people in general went to meetings or by going to meetings one feels more informed. Lane (2007) advocated that the community should be engaged from day one of the planning process, while this study revealed that the average number of meetings regarding wind energy attended by respondents never exceeded one meeting. This signifies a disconnect between level of engagement and support. Arnstein (1969) used the 'Ladder of Participation' to describe how the bottom rungs of the ladder allowed for education of participants. This study did reveal that those who attended meetings perceived themselves to be more knowledge than those respondents who did not attend meetings. Numerous studies (Blair, 2004; Jones & Eiser, 2009; Jones & Richard Eiser, 2010; Lane, et al., 2007; Rogers, 2005; Swofford & Slattery, 2010) advocated for a greater, more transparent, relationship between wind developers and the community. The

interviews conducted in this study suggest that initially wind developers were not as open in the process of wind farm development as they are in 2011. The fact that some residents didn't know about the plans for the wind farms until they had been approved by the Huron County Board of Commissioners could possibly explain the low level of meeting attendance.

One of the research questions examined the affect ownership of land had on wind farm perception and support. This study found that no significant differences between those who owned a few or many acres existed in regards to perception or support. This is in contrast to the initial analysis of interviews which suggested that a relationship existed. Van der Horst (2007) suggested that there may be a difference in individuals holding either more 'use-value' or 'existence value' and their level of opposition to wind farms. This study did not produce results that would suggest that this explanation suffices as to why individuals hold different levels of support or more positive perceptions. Analysis controlling for landowners having contracts was not conducted to see if results would be consistent with previous findings. This researcher thought that since monetary incentives were correlated to the amount of acres owned that this would explain some differences in perception and support. The data from the study did not support that hypothesis.

While locationality of support differs across townships, the mean response for all four townships were supportive. The mean of the responses indicated that survey respondents in all four townships were more supportive of wind farm siting within sight of their property as opposed to on their property; less than one-quarter of survey respondents (n=84) admitted to owning over 20 acres of land and slightly over half admitted to owning less than 3 acres of land. This preference to see an increased level of support of siting wind turbines off as opposed to on a respondents' property becomes less surprising. The highest levels of support were found to be associated with the statements of siting wind farms within Michigan, followed by within Huron

County and then farmland. This suggests NIMBY –like behavior, however one of the studied townships held an overall positive perception of and support for wind farms and would discredit the applicability of the term NIMBY. The mean level of support for siting wind turbines off the coast was higher than siting turbines on the coast. This perhaps can be explained as a development project on the coast of this magnitude would severely limit any compact future development that would increase tourist activity in the area.

The last research question tested which belief factor (environmental, social or economic) held the greatest influence over perception and support of wind farms. This study revealed that social and environmental belief factors played a larger role in forming perceptions and support of wind farms than did economic belief factors. This is unexpected. However, this finding could be explained by the level of uncertainty and lack of trust surrounding wind farms as evidenced in the interviews and in several studies (Jones & Eiser, 2009; Jones & Richard Eiser, 2010; van der Horst, 2007). Initial conclusions from the interviews led this researcher to believe that since more economic belief factors were expressed than environmental or social belief factors, economic belief factors were driving the positive or neutral perception. This is in contradiction to what was found in the question eight survey results analysis. Three out of four townships (#1, #2 and #3) had a higher mean in regards to the level of agreement of concern beliefs (not positive beliefs) or an uncertain impact on people than on the statement regarding an uncertain impact on the economy. One township (#4) had equivalent means for both questions. Three out of four townships (#2, #3 and #4) felt stronger about the statement that wind energy creates uncertain impact on the environment in comparison with the means of an uncertain impact on the economy.

About one-third of survey respondents responded that they were neutral or unsure of the effects wind energy had on the environment, the economy and on people. While a range of 28%

to 54% of survey respondents agreed or strongly agreed about their concern for the uncertain effects from wind energy on the environment, the economy and on people. Perhaps, the level of uncertainty regarding effects to people and the environment ultimately were the deciding factor in assigning a level of support or perception. Utilizing Social Exchange Theory, the proverbial weight of uncertainty may outweigh any perceived economic benefits that would be associated with wind farms. Most residents are giving up the natural landscape horizon and perceived health costs with little or no benefit. Providing more benefits to the individual communities might make wind farm development more acceptable as the perceived benefits outweigh perceived costs.

The taxable value of property in township #2 was on average less than all three other townships (see table 30). This distinction in property value difference might help explain why township #2 was consistently more positive in their perception of and support for wind farms. Respondents in township #2 may have felt like they had more to gain and less to loose in comparison to respondents in townships #1, #3 and #4. In all four townships the non-responders, on average, had a lower state equalized value (SEV –  $\frac{1}{2}$  of the property's true cash value) and taxable property value. This suggests that the nonrespondents either own on average less land or own less valuable land than those who responded.

		With Wind Farms							
	Tw	<i>p #1</i>	<i>Twp #2</i>						
	SEV	Taxable	SEV	Taxable					
Responded	\$ 72,618.42	\$ 57,526.70	\$53,054.46	\$ 44,346.21					
	(n=	=114)	(n=112)						
Didn't Respond	\$ 56,367.92	\$ 43,318.08	\$40,438.93 \$ 34,959.93						
	(n=	=106)	(n=131)						

Table 30. Property Values of Non-respondents across townships

	Without Wind Farms						
	Tw	<i>p #3</i>	Twp #4				
	SEV	Taxable	SEV Taxable				
Responded	\$ 74,803.33 \$ 57,320.78		\$66,055.93	\$ 57,234.61			
	(n:	=90)	(n=177)				
Didn't Respond	\$ 57,245.24	\$ 49,146.55	\$52,324.00	\$ 45,551.18			
	(n:	=83)	(n=175)				

Table 30 (cont'd). Property Values of Non-respondents across townships

Discussion on why survey respondents and voters differed in the percentage of support needs to be addressed. A couple of factors may have played into the differences in the level of support. The survey question was phrased differently than the questions regarding support on the ballot. The ballot would have asked about approving wind farm development within the specific townships in the County for each respective proposal, while the survey asked if the respondent would be willing to support wind farm development within the township they reside. This difference may be attributed to the fact that voting is different than answering a survey. There were different influences at the time of the November election as there were during the survey time period. The fact that the questions in the survey informed the respondents of the issues may have influenced their decision on support of wind farm development. Lastly, the fact that timing could have been an influence cannot be ruled out. The local newspaper reports almost on a daily basis on any updates to wind farm development or on any meetings held in response to wind farm development. Respondents could have easily been influenced by new information that would have surfaced, or by the fact that they heard that the wind farm proposals passed and that influenced their inclination to support future development. There may be a host of other reasons that would help to explain perceptions and level of support of wind farms that were outside the scope of this research and not addressed in this study.

### Limitations

There are a number of limitations in the applicability of this research:

1. Respondents were almost exclusively homeowners without turbines (only 2

respondents reported have turbines on their property) (see table 31).

Table 31.	Count of res	pondents unde	r wind develo	oper contract	and have	turbines o	on pro	perty	1
		1							

	With Wi	nd Farms	Without W	ind Farms	
Dependent	<i>Twp #1</i>	<i>Twp #2</i>	<i>Twp #3</i>	<i>Twp #4</i>	
Variable	( <i>n</i> =86)	( <i>n</i> =71)	( <i>n</i> =78)	( <i>n</i> =125)	Total
Currently under a	14.0%	11.3%	16.7%	6.4%	11.4%
wind contract					
n	12	8	13	8	41
Have a turbine on	1.7%	2.2%	0%	0%	.8%
property					
n	1	1	0	0	2

 Many ways of learning or gaining knowledge exist. Media sources such as blogs, social networks, newspaper (editorial or headlines), public meeting minutes as well as talk within a local restaurant is liable to shape, expand or further solidify what was already believed.

## Conclusions

Within the limitations of the study the following conclusions are warranted:

- Proximity of a residence to a wind turbine, knowledge held about wind energy and land ownership were not found to be significant predictors of perception and level of support for wind farms; a focus on these factors, however, may have masked the importance of other factors from surfacing.
- 2. Social and environmental belief factors in the form of concerns were found to be more influential than economic belief factors in determining support and perceptions

of wind farms in Huron County. Social and environmental beliefs about positive outcomes of wind turbines were strongly related to support for wind farm development, yet concerns regarding impact on the environment, economy and people existed. Social beliefs about positive outcomes were strongly related to perceptions of wind farm development followed by economic beliefs about outcomes of wind farm development. Respondents who were neutral in their opinions before development tended to perceive wind farms negatively after wind farm construction.

#### Recommendations

Much research has focused on factors influencing the level of opposition residents have toward wind farms (Bell, et al., 2005; Blazevic, 2009; Devine-Wright, 2005; Eltham, et al., 2008; Johansson & Laike, 2007; Jones & Eiser, 2009; Ricci, et al., 2010; Swofford & Slattery, 2010; van der Horst, 2007; Wolsink, 2007). While this research is important to the field, research must now focus in on how the level of engagement with community members influences perception and support of wind farms. The following are recommendations for future study in the area of wind farm development. While there are no direct recommendations from this research, information gleaned from literature, interviews and from personal knowledge suggest some broader recommendations. The recommendations are organized first on the community level and then on specific research that should be conducted in the community.

1. The local governmental authority and wind developers must work to alleviate the uncertainty surrounding this innovation among community members, perhaps by utilizing outreach to the community, creating stronger relationships between wind developers, local government and residents in addition to being clear and transparent in the process and decision making of future wind farm development. In addition, investing in research that tests the 'promised' outcomes or effects of wind farms in a

community against the outcomes that actually precipitated from wind farm development.

- 2. The county should seek out other benefits that could be rewarded to the communities 'hosting' wind farms. The communities are giving up something (natural landscape) and have their horizon changed for a significant amount of time. Developers could become more involved with the community by volunteering in the community (must be genuine and not forced), sponsor a county-wide event that would celebrate the presence of the wind turbines that all residents could take part in or offer sponsorship to underfunded community programs.
- 3. The community at large must benefit from a wind farm as a neighbor. Wind developers could dedicate open spaces, parks or trails to the community members. Doing so will reach a larger audience and will communicate that values other than economic are associated with wind farms and in turn wind developers will increase their perceived value in a community.
- 4. The community must acknowledge and work with the differing perceptions and beliefs toward wind farms and allow residents to be a part of the planning process from the beginning of project development.
- 5. More quantitative research needs to be performed assessing not just perceptions and support of wind farms, but also the acceptable levels of wind farm development.
- A focus group discussing survey analysis results and viable options for future development should be explored.
- 7. Further research should be conducted, examining how the flow of money affects the community at large. How large of an impact does the money flowing into the

community from royalties or taxes have on the whole community and not just those individuals receiving direct economic benefit?

- 8. Research needs to be performed to see if there are projects that can be developed in conjunction with wind farms to spur the economy and create a better quality of life for the residents and also move local residents onto the locally generated wind energy grid creating energy 'self-sufficiency' for the area.
- Link how level of individual efforts contribute to a larger goal of cleaner, more efficient energy globally – particularly in a geographic area so close to a fragile Great Lakes ecosystem.

# APPENDICES

## APPENDIX A

# **Participant Consent Form**

## Participant Consent Form

## Research of perceptions of the stakeholders in wind energy production in the Thumb of Michigan

## **Participant Consent Form**

You are being asked to participate in a research project designed to better understand the perceptions and experiences of resident landowners, homeowners and community planners involved in the planning and development of wind turbines. Research consists of a series of interviews with people who are currently involved and/or affected by the wind energy proposal. This first stage will inform the development of a survey.

We expect each interview to take approximately 45-60 minutes. We will ask about perceptions of wind energy development in the area as well as a more general perception of sustainable development. Interviews will be audio taped. Through these interviews, we hope to document perspectives on the current motivators and challenges of developing the proposed wind farms in your area, which could potentially improve future community development research and policy changes so that they fit the needs of modern rural communities.

We do not perceive any risk to anyone who chooses to participate in these interviews. You have the right not to participate, to refuse to answer any questions or to withdraw at any time. Your name will only be used if you give permission. However, it should be kept in mind when responding to our questions that sometimes people in positions such as yours are well known for a particular point of view or position that would lead others to be able to identify you. The researchers will keep all interview information in their offices and on password-protected computers. Information you give may be used as data in a public documents (e.g., research journal articles, outreach bulletins). You must be 18 years or older to participate in this study.

If you have concerns or questions about this study, please contact the researchers: • Theresa Groth, phone: (805) 450-7801; email: grothth1@msu.edu; or by regular mail: 131 Natural Resources Building, Michigan State University, East Lansing, MI 48824-1222 • Dr. Christine Vogt, phone: (517) 432-0318; email: vogtc@msu.edu; or by regular mail: 131 Natural Resources Building, Michigan State University, East Lansing, MI 48824-1222

If you have questions or concerns about your role and rights as a research participant, would like to obtain information or offer input, or would like to register a complaint about his study, you may contact, anonymously if you wish, the Michigan State University's Human research Protection Program at 517.355.2180, Fax 517.432.4503, email irb@msu.edu or regular mail at 207 Olds Hall, MSU, East Lansing, MI 48824.

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## Please Initial:

\_\_\_\_\_ I agree to allow audiotaping of the interview

Your signature below means that you voluntarily agree to participate in this research.

Signature of Participant

# **APPENDIX B**

**Interview Guide** 

## Interview Guide

# Demographics

- 1. Tell me a little bit about how long you have lived and worked in the Thumb area.
- 2. Do you currently live and work in the Thumb area year-round or only part of the year?
- 3. Are you a landowner? If so how many acres?
- 4. Do you farm? How long have you been farming? During that time period have you noticed a shift in the ability to make a living on those acres?
- 5. Are you a business owner, employee, elected official, volunteer, member of civic organization or something else? (Determine level and type of community activity and roles)
- 6. How would you describe your level of engagement in the Thumb's community activities? (Probe: local government, community service, civic organizations, community committees, economic development work groups)
- 7. How would you describe your level of engagement in the Thumb's tourism or economic development activities? (Probe: what type activities and what type of role leadership, volunteer or advocate?)
- 8. How would you describe your level of involvement in the Thumb's community planning activities?

Economic Development

- 9. What type of development should be a high priority for the Thumb area? Low priority? Why? (Probe: transportation, services, attractions, physical community elements, wind energy, wind farm development, information/marketing, food and agriculture, manufacturing).
- 10. What are the greatest challenges to economic development in the Thumb? Tourism development?
- 11. What do you feel are the most important activities to further support or develop economic development?
- 12. Were you involved in the planning process of the wind farms? If so what was your role and when did you become involved?

# Wind Farms

- 13. Were you approached by anyone regarding the proposed wind farm development? If so, which company were they representing? (Probe: attitude toward wind farm/attitudes of landowners toward wind farms).
- 14. What was the process? What did they say/offer?
- 15. How do you currently view the wind farms? Positive/Negative?
- 16. What are the primary benefits of the current/proposed wind farms? Drawbacks or costs?
- 17. How do you view further development? Does anything need to be addressed before development continues?

- 18. Are landowners with turbines or contracts helping everyone? In your opinion is this an equitable process? Is this the best course of action for this area?
- 19. Do you have any personal experiences or consequences from the wind farms?

Sustainable Development

- 20. Are you familiar with the term sustainability? What does it mean to you?
- 21. Do you view wind farms as fitting into the realm of sustainable development? Why or why not?
- 22. Do you think your community focuses on sustainability as one of its planning goals? If so, can you provide an example?

**Community Development** 

- 23. Who has the largest responsibility for community planning? The local government, business community, local residents, grassroots community organization, or a combination?
- 24. The success of community planning is oftentimes dependent on local leadership. Please describe the relationship between local leadership and planning activities in Huron County. Do local leaders support wind farm development? Is there disagreement among leaders regarding planning initiatives, goals, and objectives?
- 25. Do residents feel as if their voices are heard by local leaders? Why or why not?
- 26. Do current planning efforts give adequate consideration to social, environmental and economic issues? Are social, economic, and environmental conditions "in balance" in Huron County? (Probe: What about future plans working toward more sustainable community conditions)
- 27. What do you see as being the key(s) to success in Huron County? Does renewable energy play a role?
- 28. Additional Comments:

# **APPENDIX C**

Comparison of Survey Respondent Responses by Township by Question

Comparison of Survey Respondent Responses by Township by Question

## **Question 1**

	With Wi	nd Farms	Without W	Vind Farms	
Dependent	<i>Twp #1</i>	<i>Twp #2</i>	<i>Twp #3</i>	<i>Twp #4</i>	
Variable	( <i>n</i> =112)	( <i>n</i> =109)	( <i>n</i> =88)	( <i>n</i> =175)	Chi-Square
W/in city/village	42.9%	52.3%	27.3%	50.9%	16.147**
limits <sup>a</sup>					
Outside	52.7%	47.7%	28.4%	25.7%	29.359***
city/village					
limits <sup>a</sup>					
Outside	0.9%	0.0%	45.5%,	26.9%,	99.580***
city/village limits			$x^2 = .07$	$x^2 = .20$	
along/near Lake					
Huron coastline <sup>a</sup>					

Table 1a. Location of residency

Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach <sup>a</sup>Each question was posed separately with a two point scale from (0) no to (1) yes. \*p<.05, \*\*p<.01, \*\*\*p<.001

### **Question 2**

Table 2a. Land ownership, wind contract and wind turbines on property

	With Wi	nd Farms	Without W	ind Farms	
Dependent	Twp #1	<i>Twp #2</i>	<i>Twp #3</i>	<i>Twp #4</i>	
Variable	-	-	-	-	Chi-Square
Own Land <sup>a</sup>	81.1%,	68.2%,	87.8%,	70.8%,	14.54**
o win Lunia	n=90	n=75	n=79	n=121	
Mean # Acres <sup>b</sup>	37.7 acres,	25.3 acres,	35.2 acres,	34.8 acres,	F Value
	n=86	n=66	n=73	n=114	.23
Under Contract <sup>a</sup>	14.0%,	11.3%,	16.7%,	6.4%,	5.80
	n=12	n=8	n=13	n=8	
Turbines on	1.7%,	2.2%,	0.0%,	0.0%,	2.74
Property <sup>a</sup>	n=1	n=1	n=0	n=0	

Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach

<sup>a</sup>*Two point scale from (0) no to (1) yes. Some respondents indicated that they did not own land.* <sup>b</sup>*This was an open ended question.* 

\*p<.05, \*\* p<.01, \*\*\*p<.001

### **Question 3**

Table 3a. Number of miles, as the crow flies, respondent lives from the nearest wind turbine

	With Wind	l Farms	Without W	ind Farms		
	Twp #1	<i>Twp #2</i>	<i>Twp #3</i>	<i>Twp #4</i>		
Dependent	(n=109)	(n=103)	( <i>n</i> =84)	( <i>n</i> =168)		Group
Variable	Mean	Mean	Mean	Mean	F	Comparison
Miles to	.82	1.95	20.38	15.76	428.07***	1<3, 4; 2<3,
Nearest						4; 3>4
Turbine <sup>a</sup>						

Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach <sup>a</sup>This was an open ended question.

\*p<.05, \*\* p<.01, \*\*\*p<.001

#### **Question 4**

Table 4a. How knowledgeable do you consider yourself about...[the following]

	With Wi	nd Farms	Without W	ind Farms		
Dependent	Twp #1	<i>Twp #2</i>	<i>Twp #3</i>	<i>Twp #4</i>		Group
Variable	Mean	Mean	Mean	Mean	F	Comparison
Renewable	2.66,	2.36,	2.53,	2.52,	2.05	
energy <sup>a</sup>	n=111	n=107	n=87	n=176	2.05	n.s.
Wind energy <sup>a</sup>	2.72,	2.47,	2.58,	2.56,	1.46	na
	n=112	n=110	n=88	n=174	1.40	11.8.
Sustainable	2.25,	2.08,	2.16,	2.10,	71	
development <sup>a</sup>	n=107	n=103	n=86	n=171	./1	n.s.

Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach

<sup>*a*</sup>*Five-point scales from (1) not at all knowledgeable, to (5) extremely knowledgeable.* p < .05, \*\* p < .01, \*\*\*p < .001

#### Question 5 & 9

	With Wi	nd Farms	Without Wind Farms			
Dependent	Twp #1	<i>Twp #2</i>	<i>Twp #3</i>	<i>Twp #4</i>		Group
Variable	Mean	Mean	Mean	Mean	$\mathbf{F}$	Comparison
Before <sup>a</sup>	3.55,	3.63,	3.57,	3.72,	.64	n.s.
201010	n=105	n=91	n=79	n=161		
Now <sup>a</sup>	3.31,	3.84,	3.19,	3.58,	5.13**	1<2, 2>3
	n=112	n=106	n=86	n=161		
Difference <sup>a</sup>	20,	.20,	43,	14,	5.73***	1<2, 2>3
	n=105	n=90	n=77	n=153		

Table 5a. Perception 'Before' and 'Now' that wind turbines exist

*Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach* 

<sup>*a*</sup>*Five-point scale from (1) very negative, to (5) very positive.* \*p<.05, \*\*p<.01, \*\*\*p<.001

## **Question 6**

Table 6a. Number of public meetings regarding wind energy respondents attended in the last five years

	With Wind Farms		Without W	<b>Vind Farms</b>		
Dependent	Twp #1	<i>Twp #2</i>	<i>Twp #3</i>	<i>Twp #4</i>		Group
Variable	Mean	Mean	Mean	Mean	F	Comparison
# Meetings	1.00,	.42,	.83,	.27,	11.71***	1>2, 4; 3>4
Attended <sup>a</sup>	n=112	n=111	n=89	n=173		

*Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach* 

<sup>a</sup>Six-point scale from (0) zero, to (5) five or more. \*p<.05, \*\*p<.01, \*\*\*p<.001

### **Question 7**

	With Wi	nd Farms	Without Wind Farms			
Dependent	<i>Twp #1</i>	<i>Twp #2</i>	<i>Twp #3</i>	<i>Twp #4</i>		Group
Variable	Mean	Mean	Mean	Mean	F	Comparison
At home <sup>a</sup>	4.73,	4.35,	1.28,	1.38,	336.40***	1>3, 4, 2>3, 4
	n=113	n=107	n=83	n=159		
When driving <sup>a</sup>	4.88,	4.67,	3.22,	3.43,	119.85***	1>3, 4, 2>3, 4
,,	n=112	n=110	n=89	n=172		
In the	4.85,	4.58,	3.11,	3.27,	119.25***	1>3, 4, 2>3, 4
countryside <sup>a</sup>	n=112	n=108	n=88	n=171		
In town <sup>a</sup>	4.66,	4.27,	1.30,	1.23	417.40***	1>2, 3, 4,
	n=111	n=103	n=83	n=164		2>3, 4
On the	1.23,	1.70,	1.06,	1.13,	16.13***	1<2, 2>3, 4
coastline <sup>a</sup>	n=103	n=97	n=84	n=164		

Table 7a. Location and frequency of seeing wind turbines

*Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach* 

<sup>*a*</sup> Five-point scale from (1) never to (5) everyday.

\**p*<.05, \*\**p*<.01, \*\*\**p*<.001

## **Question 8**

Table 8a. Level of agreement that wind energy creates outcomes

		With Win	nd Farms	Withou	it Wind		
				Fai	rms		
Belief	Dependent	Twp #1	<i>Twp #2</i>	Twp #3	<i>Twp #4</i>		Group
Factor	Variable	Mean <sup>a</sup>	Mean <sup>a</sup>	Mean <sup>a</sup>	Mean <sup>a</sup>	F	Comparison
	Increases	60,	13,	71,	49,	5.81**	1<2, 2>3
	property value	n=113	n=109	n=90	n=175		
	Unreliable	.16,	36,	.12,	14,	5.42**	1>2, 2<3
	output	n=112	n=109	n=89	n=175		
nic	Uncertain	.29,	03,	.38,	.02,	3.79*	n.s.
onc	impact on	n=111	n=107	n=88	n=175		
con	economy						
Εč	Brings	.19,	.44,	.17,	.28,	1.35	n.s.
	economic	n=112	n=108	n=88	n=176		
	benefit						
	Creates	.25,	.71,	12,	.03,	12.37***	1<2, 2>3, 4
	tourism	n=111	n=108	n=89	n=174		

*Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach* 

<sup>*a*</sup> Five-point scale from (-2) strongly disagree to (2) strongly agree. \*p<.05, \*\*p<.01, \*\*\*p<.001

		With Win	nd Farms	Withou	it Wind		
Belief				Fai	rms		
Factor	Dependent	<i>Twp</i> #1	<i>Twp #2</i>	Twp #3	<i>Twp #4</i>		Group
	Variable	Mean <sup>a</sup>	Mean <sup>a</sup>	Mean <sup>a</sup>	Mean <sup>a</sup>	F	Comparison
	Land back in	18,	08,	38,	33,	1.20	n.s.
	natural state	n=110	n=106	n=89	n=175		
	Multiple uses	.30,	.54,	.18,	.22,	2.91*	n.s.
		n=109	n=103	n=88	n=176		
ntal	Uncertain	.22,	.03,	.51,	.07,	4.14***	2<3, 3>4
neı	impact on	n=110	n=106	n=88	n=174		
oni	environment						
vir	Danger to	54,	91,	32,	50,	5.48**	2<3,4
En	wildlife	n=113	n=108	n=90	n=173		
	Clean energy	1.01,	1.07,	.83,	1.01,	1.56	n.s.
	source	n=111	n=107	n=89	n=176		
	Renewable	.94,	1.00,	.69,	.93,	2.06	n.s.
	resource	n=110	n=107	n=89	n=176		
	Creates noise	.16,	51,	.22,	02,	9.08***	1>2, 2<3, 4
		n=112	n=107	n=90	n=175		
	Attractive	21,	.25,	61,	24,	9.17***	1<2, 2>3, 4
	feature	n=113	n=108	n=90	n=176		
	Requires too	.22,	30,	.30,	.02,	6.63***	1>2, 2<3
	many	n=112	n=108	n=89	n=175		
	Part of	.14,	.62,	.26,	.27,	4.07***	1<2
	innovation	n=111	n=107	n=89	n=176		
	Renewed	.29,	.79,	.11,	.33,	7.52***	1<2, 2<3, 4
Ц	interest	n=113	n=107	n=90	n=175	. 10	
ocie	Safe energy	.68,	.94,	.58,	.76,	2.48	n.s.
Sc	source	n=113	n=105	n=90	n=175	10.10.11	
	Creates	.55,	21,	.26,	.10,	10.42***	1>2, 4, 2<3
	flicker	n=112	n=107	n=88	n=1/5		1.0.0.0.4
	Unwanted	.16,	45,	.28,	01,	9.94***	1>2, 2<3, 4
	change	n=112	n=108	n=89	n=1/6	0.05****	1.0.0.0
	Hazardous to	31,	90,	19,	57,	9.85***	1>2, 2<3,
	people's	n=112	n=108	n=88	n=1/5		3>4
	health	2.4	10	4.4	02	1 (0+++	2. 4
	Uncertain	.54,	.10,	.44,	.02,	4.60**	5>4
	impact on	n=108	n=108	n=89	n=1/6		
	people						

## Table 8a (cont'd). Level of agreement that wind energy creates outcomes

Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach <sup>a</sup> Five-point scale from (-2) strongly disagree to (2) strongly agree. \*p<.05, \*\*p<.01, \*\*\*p<.001

#### Question 10

Table 9a. Level of agreement on whether wind turbines symbolize a sign of progress in modern energy crisis

	With Wind Farms		Without W	ind Farms		
	<i>Twp #1</i>	<i>Twp #2</i>	<i>Twp #3</i>	<i>Twp #4</i>		
Dependent	( <i>n</i> =112)	(n=109)	( <i>n</i> =90)	(n=175)		Group
Variable	Mean	Mean	Mean	Mean	$\mathbf{F}$	Comparison
Sign of	.55	.94	.32	.65	5.59**	2>3
progress <sup>a</sup>						

Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach <sup>a</sup>Five-point scale from (-2) strongly disagree, to (2) strongly agree.

\**p*<.05, \*\* *p*<.01, \*\*\**p*<.001

#### **Question 11**

### Table 10a. Wind energy is beneficial to have in Huron County

	With Wind Farms		Without W	ind Farms		
	Twp #1	<i>Twp #2</i>	Twp #3	<i>Twp #4</i>		
Dependent	( <i>n</i> =113)	( <i>n</i> =110)	(n=88)	( <i>n</i> =176)		Group
Variable	Mean	Mean	Mean	Mean	$\mathbf{F}$	Comparison
Beneficial to	.26	.77	.24	.53	4.652***	1<2, 2>3
County <sup>a</sup>						

*Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach* 

<sup>a</sup>Five-point scale from (-2) strongly disagree, to (2) strongly agree. \*p<.05, \*\*p<.01, \*\*\*p<.001

### **Question 12**

Table 11a. Location resident would be willing to support wind farms

	With Wi	nd Farms	Without Wind Farms			
Dependent	<i>Twp #1</i>	<i>Twp #2</i>	<i>Twp #3</i>	<i>Twp #4</i>		Group
Variable	Mean	Mean	Mean	Mean	$\mathbf{F}$	Comparison
Don't support <sup>a</sup>	28,	61,	16,	35,	2.11	n.s.
	n=109	n=109	n=88	n=174		
On my	17,	.35,	06,	02,	3.02*	1<2
property <sup>a</sup>	n=109	n=103	n=87	n=173		
W/in sight of	.09,	.76,	.11,	.19,	6.51***	1<2, 2>3, 4
property <sup>a</sup>	n=109	n=105	n=89	n=175		

Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach

<sup>a</sup>*Five-point scale from* (-2) *strongly disagree, to* (2) *strongly agree.* 

<sup>b</sup>No significant mean group difference.

\**p*<.05, \*\**p*<.01, \*\*\**p*<.001

	With Wi	nd Farms	Without W	/ind Farms		
Dependent	Twp #1	<i>Twp #2</i>	<i>Twp #3</i>	<i>Twp #4</i>		Group
Variable	Mean	Mean	Mean	Mean	$\mathbf{F}$	Comparison
On farmland	.32,	.81,	.39,	.41,	3.78**	1<2
	n=109	n=106	n=88	n=175		
On public land	.25,	.63,	.21,	.39,	2.28	n.s.
in H.C.	n=111	n=105	n=89	n=172		
On coast of	.01,	.29,	10,	.06,	1.53	n.s.
H.C.	n=111	n=108	n=89	n=175		
Off coast of	.15,	.40,	.11,	.14,	1.24	n.s.
H.C.	n=109	n=107	n=89	n=176		
W/in H.C.	.38,	.89,	.46,	.54,	3.92**	1<2
	n=111	n=107	n=89	n=176		
W/in MI	.63,	1.01,	.69,	.71,	2.96*	n.s. <sup>b</sup>
	n=112	n=106	n=88	n=175		

Table 11a (cont'd). Location resident would be willing to support wind farms

Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach

<sup>a</sup>*Five-point scale from (-2) strongly disagree, to (2) strongly agree.* 

<sup>b</sup>No significant mean group difference.

\**p*<.05, \*\* *p*<.01, \*\*\**p*<.001

### **Question 13**

Table 12a. Support of wind farm development at any location in your township

		With Wi	With Wind Farms		ind Farms	-
		<i>Twp #1</i>	<i>Twp #2</i>	<i>Twp #3</i>	<i>Twp #4</i>	
Dependent Variable		( <i>n</i> =108)	(n=103)	(n=86)	(n=163)	Chi-Square
Support of	Oppose	44.4%,	25.2%,	45.3%,	41.7%,	11.44*
development <sup>a</sup>		<i>n</i> =48	n=26	n=39	n=68	
······································	In Favor	55.6%,	74.8%,	54.7%,	58.3%,	
		n=60	n=77	n=47	n=95	

Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach

<sup>a</sup>Two-point scale from (0) no, to (1) yes. \*n < 05 \*\* n < 01 \*\*\*n < 001

\*p<.05, \*\* p<.01, \*\*\*p<.001

#### **Question 14**

Dependent	ent With Wind Farms		Without W	<b>ind Farms</b>	F	Group
Variable	<i>Twp #1</i>	<i>Twp #2</i>	<i>Twp #3</i>	<i>Twp #4</i>		Comparison
	( <i>n</i> =113)	( <i>n</i> =110)	(n=89)	( <i>n</i> =173)		
	Mean	Mean	Mean	Mean		
Age <sup>a</sup>	54.29	59.43	59.66	57.55	3.28*	n.s. <sup>b</sup>

Table 13a. Age of Survey Respondent

*Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach* 

<sup>a</sup>*This was an open ended question.* 

<sup>b</sup>No significant mean group difference. \*p<.05, \*\*p<.01, \*\*\*p<.001

#### **Question 15**

Table 14a. Gender of Survey Respondent									
Dependent Variable		With Wind Farms		Without W	Chi-Square				
		<i>Twp #1</i>	<i>Twp #2</i>	<i>Twp #3</i>	<i>Twp #4</i>				
		( <i>n</i> =112)	( <i>n</i> =111)	(n=89)	( <i>n</i> =176)				
Gender <sup>a</sup>	Male	48.2%,	51.4%,	55.1%,	49.4%,				
		n=54	n=57	n=49	n=87	1.00			
	Female	51.8%,	48.6%,	44.9%,	50.6%,	1.08			
		n=58	n=54	n=40	n=89				

Table 14a. Gender of Survey Respondent

Twp #1 = Bingham, Twp #2 = Oliver, Twp #3 = Rubicon, Twp #4 = Sand Beach

<sup>a</sup>*Two-point scale from (1) male, to (2) female.* \**p*<.05, \*\**p*<.01, \*\*\**p*<.001

#### **Question 16**

Table 15a. Length of time over lifetime spent living in Huron County

Dependent	With Wind Farms		Without Wind Farms		F	Group
Variable	<i>Twp #1</i>	<i>Twp #2</i>	<i>Twp #3</i>	<i>Twp #4</i>		Comparison
	( <i>n</i> =112)	( <i>n</i> =111)	( <i>n</i> =88)	( <i>n</i> =174)		
	Mean	Mean	Mean	Mean		
Years <sup>a</sup>	43.58	49.13	38.39	43.13	5.45**	2>3

*Twp* #1 = Bingham, *Twp* #2 = Oliver, *Twp* #3 = Rubicon, *Twp* #4 = Sand Beach

<sup>a</sup>*This was an open ended question.* \*p<.05, \*\* p<.01, \*\*\*p<.001

# **APPENDIX D**

Additional Comments from Survey

# Table 16a. Open-Ended Comments

Respondent	Comments	Township
372	Wind turbines need to be set farther apart and farther from homes. Wind turbines should be set on some state land, state could use the money. I believe strobing/flickering, noise and vibrations do bother/harm some people. I feel wind companies are taking advantage of landowners and the contracts are in their favor.	1
402	Wind turbines need to be classified as industrial in nature just like any other form of energy producing facility and treated as such. The problem is not that they exist but WHERE they have been allowed to be built. Site planning and zoning which not only takes into consideration the economic benefits but also the social and health impacts are a must.	1
521	Wind turbines have caused families not to talk to each other, I hate looking at them things every day. I cannot even sit in my sunroom and read without these things going around and around. They will be useless in about 5 years, just like other things that were invented and the sad part, will have to look at these without them being removed.	1
561	Wind is free - coal cost money and health	1
851	Wind farms do not bring adequate economic value but deteriorates real estate marketable valves and tourism scenery.	1
457	Wind energy is preferable to nuclear or coal or oil plants in H.C., which is a tourist Mecca!	1
99	Wind energy is as clean and environment friendly as any source of energy at this time. I live as close to a windmill as anyone and have NEVER had any problem with noise or vibration. I think it is pure jealousy on the part of those who don't have a turbine and have to look at them!!!	1
903	We need coal and nuclear power plants to provide continuous, dependable, cheap electricity along with wind and solar power.	1
445	We had to make a decision to sell our 1.5 acres of beautiful, prime building site due to wind turbine placement. No one wants a turbine right behind their \$250,000 new home:(	1
446	We are guinea pigs. We have no idea what they will do to us over time, they're expensive "Gov" supported, inefficient could be obsolete shortly better alternative. No storage! Our children and grandchildren could be affected. I saw them in CA in desert, NOT highly populated areas. "They" have a gag order for contracted people, another red flag?	1

# Table 16a (cont'd). Open-Ended Comments

852	Villages cannot vote. All the power goes out of the state. Blades cops up TV. Had to go to cable - I HATE THEM!	1
323	Ubly is located in a valley. Entering our village from any direction you would be going downhill. It's always been quite beautiful for me. Now the beauty is gone and the focus is on these monstrous eyesores. Our relatives, who visited before the windmills, ask how we could have allowed these people to destroy our community this way! All the money in the world isn't worth what they did to our landscape.	1
338	Turbines - creates shadows/flickers, noise-pending speed and direction, hard feelings between neighbors/families. They are not cost efficient on turbine placement, too close to residents. I am interested to see how much Huron County benefits. The land owner benefits.	1
759	This is the single most devise issue in the county right now. It is turning family member & friends against one another. The county should explore solar as a renewable energy source.	1
633	They do not pay for the energy they produce in their lifetime.	1
647	They build these wind farms in Ubly, MI where I live. Where's the savings for me?? NONE!! Energy is sent across state. Thanks for that.	1
662	These wind mills in Bingham Township are an eyesore. I'm very unhappy to see them. People who live by them are angry and have health issues. One transformer was already vandalized w/a bullet hole. I didn't have a choice - the people who gained monetary values by having them on their property made the choice w/out my approval. Some of the time w/there is no wind, so how can this be energy in the making - Just a thought - who replaces them after 25-50 years of use?	1
897	These things are Horrid! Noisy, distracting, bright lights on top at night. Brought NOTHING to our community - not even contract jobs (all come from outside). Wind energy is NOT good for Michigan. The only benefit is the rich get richer - and then everyone else gets the raw end of the deal.	1
657	There is a mountain of information out there on the health effects of living too close to wind turbines. We need to sight them further from our homes as we are bombarded with pressure changes that keep us awake and is affecting our sleep. This is not healthy.	1

Table 16a (cont'd). Open-Ended Comme	ents
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56	The turbines in Ubly were poorly placed and there are TOO many. They didn't take the landscape into consideration and due to the valley that Ubly is in the turbines create a loud thumping noise most days and nights disturbing sleep and outdoor activities. Noble Wind Energy created controversy and turmoil between family and friends! The type of turbines in Elkton are much more quiet than the ones in Ubly! Also, due to living within the village limits of Ubly we could not vote on the turbines in the last election but we are still affected by them - very unfair.	1
994	The only thing I question as to benefiting Huron County is that all the electric goes out of the state & does not benefit Huron County electrical usage.	1
927	The old timers say it best. When electricity came no one wanted it, it was the 'evil.' Now you can't live without it. Change is hard for some people. Think of our children and grand children. RENEWABLE RESOURCES!	1
603	Sorry, this box is way too small for my comments.	1
726	Sorry that I didn't respond to your survey sooner, but I've been disillusioned with the Wind Farm in Huron County. I went to one meeting. At that time our commissioners told us that they had to move fast or the wind company was going to pull out. They told about all the pluses, no negatives as far as they were concerned. One commissioner said he even drove to a wind farm, parked his car and slept overnight under it. Never heard a thing. I wrote to another commissioner and told him my concerns, he never responded. If I talked to these commissioners today, I would tell them that I built a new home three years before the windmills came to Ubly. Everything was fine until the windmill came now I have a list of problems: I can hear the noise inside my new home, depending on the direction of the wind, red blinking lights reflect off of my furniture through the windows at night, I had to put blinds on my windows because of the shadows of the spinning blades, I believe the value of my home has gone down, who would want to buy a new home with these concernsthe wind companies? I don't think they would be interested. Thank you for your time. I wish you would have collected this information before the wind park came to Ubly.	1
122	Question 12 was poorly written - hard to figure out - confusing.	1
63	NOT COST EFFICIENT - no local jobs.	1
966	My niece and her husband have wind turbines on their farm. The closest from their home is .25 mile. I've only heard noise from it one time when the wind was out of a certain direction.	1

-		
981	In question 13, I didn't like the use of the word "any." There needs to be regulations attached. I wouldn't want to see on in the middle of the	1
	playground.	
589	If we have to hear and see them everyday which I do, it would at least be	1
	nice to benefit from them. I don't understand why the energy is shipped	
	across the state. Yes, it's clean energy but it's also an annoying one. The	
	people who benefit are not blinded by flashing lights in their back yard or	
	hearing whoosh, whoosh in their deer blind.	
917	If more wind mills go in Huron Co. put stars on motors & paint propellers	1
	red, white & blue for more view.	
204	If anyone has a wind turbine contract, they should be obligated to huy	1
294	THEIR electricity at the higher 'green' energy price	1
	Then cleaned y at the higher green energy price.	
418	If a majority of people in a gov't agency - village, township, city, etc.	1
	wanted wind turbines on public land - not parks - I would likely support.	
847	I'm very sensitive to motion and movement, so I personally could not have	1
	one in my constant view. As I leave Ubly I have to put my hand to the side	
	of my eye & focus ahead until I pass them. I'm happy to have them in our	
	community. Good luck on your research!	
644	I would like to have a wind mill in my backyard. I like the idea of being	1
	helpful to preserve our nature.	
637	I would be happier if the people in Huron County actually benefited from	1
037	the energy received the energy and lowered my energy costs	1
137	I was asked some time ago how close would you want to live to a turbine?	1
	(No closer than $1/2$ mile) What I don't like is whenever they are shut down.	
	As long as they are working they have a purpose. I wish that there would be more economic help from wind farms for the people that live with them	
	Also help libraries Thank you!	
	The map hormation thank your	
359	I want everybody to have one in their backyard so they can listen to the God	1
	forsaken noise!!!	
161	I think we need them.	1
201	I think they are nice	1
271		1
926	I think some of the turbines are too close to residences. I've seen the effects	1
	of flickers in people's homes. What a nuisance!	

Table 16a (cont'd). Open-Ended Comme	ents
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922	I think it is a privilege to have the wind mills in our area - they are so breath- taking and such a proof of progress and the future.	1
167	I think \$ brought into the community is short term - during building phase. I think the townships and county should get some of the profits and not just the landowners. Some of the landowners don't have to look at them or listen to them and they make pretty good \$ having them on their land.	1
808	I support wind farms, although the # of farms/density is a concern. I would like to see wind farm development throughout the county sporadically, but NOT EVERYWHERE. If the area is overrun with windmills then my opinions would likely change. I hope you plan on publishing the findings of this survey in the Huron Daily Tribune.	1
504	I support wind farms because it is a clean source of energy not like the oil spill in our lakes or the smell of the gases on your way going to Bay City.	1
243	I live in Ubly - wind mills are great - thank you.	1
679	I live in Bingham township & I see many windmills every day. I enjoy watching them. I can't understand why people are negative about them. I welcome the revenue into our area.	1
602	I live close enough to them to know they are bothersome. When the wind is from the right (wrong) direction the noise and vibrations accumulate over 4- 5 of them and the waves increase and decrease in volume. I have heard them be louder a mile away from them then a 1/2 mile from them. Submitted by Son. Sometimes the noise is amplified by the affects of 2-3 windmills. The volume increases. Humidity affects it also. Humid days are louder. Turbulence is compounded "Accumulate Turbulence"	1
278	I know people who have health issues from wind farms and nothing is being done. They have to sue the wind farm to get any kind of recourse. Also most of the work is done by people out of our area. Another reason one and a half million dollars, creates one job in the wind industry. I really would like to see a health study done. People in Huron County are having the same problems that others living near wind farms have.	1
207	I hope the results of this survey will be shared with participants as well as county officials and the general public.	1
478	I have family with wind turbines and am a backer of the ones we have. 46 in all we've watched the construction from start to finish	1
569	I have a TV antenna system. Ever since the turbines were turned on the end of November of 2008 my TV reception is BAD. I still have a TV antenna system. WHY should I be forced to get CABLE TV - DISH- OR DIRECT TV BECAUSE OF WIND TURBINES. I was told to complain to the FCC and I am going TO. JOHN DEER SHOULD PAY FOR MY TV SYSTEM OF MY CHOICE FOR EVER. THE TURBINES ARE THE CAUSE.	1
-----	--	---
664	I feel they should be all at one location instead of being scattered all over the county.	1
790	I feel the statement that turbines save agriculture is a ploy to allow them here. I think ALL residents of the county should be allowed to vote on having or not having turbines (all cities, villages & townships should be able to vote.)	1
55	I feel anyone with farmland should be able to do with it as they please. If they want a turbine that is their choice. I wouldn't want anyone telling me what to do with my property. I live right in Ubly. I have a turbine about 1 mile away from my house and yes when I am OUTSIDE I can sometimes hear the swish from the turbine, but it is nothing compared to the drag strip every weekend during the summer all three days long. And in the fall the dryers from the elevator all night I can hear from inside my house.	1
459	I don't like the looks it does to our vicinity. Sorry not to answer all but I am not interested in them.	1
825	I don't know a lot about this subject. I do believe if it helps to improve our world in a positive way, why not? I have friends that have the wind mills and are happy with them. Then people who don't have them that object. As for me, I'm more neutral.	1
972	I do not think turbines are the answer. They are only going in because of govt. mandate. They are a bad investment. Conservation is the key to saving energy.	1
636	I do not believe in use of taxpayer money to subsidize the erection of wind towers. I also do not benefit or get a discount of electricity of wind tower in our area.	1
250	I believe these windmills are an 'eye sore' lowering property value and only benefiting the property owners.	1
109	I am sorry that I cannot fill out my wind farm survey. I would love to be honest and answer the questions, but I wouldn't want to risk losing my job.	1

631	Huron Co. is/was an agricultural and tourism area. Since wind turbines, property values are down. No energy break/lower electric bills for those living near wind turbines only an increase in our bills. People with wind turbines on their property are benefiting; getting rich.	1
204	Hard to like or dislike something you do not know the long-term effects of.	1
541	Had plans to build new home on farmland. Now that it is surrounded by turbines have dropped that plan. When we were approached to lease our land I said "NO" but neighbors agreed.	1
756	Good luck with your research/survey!	1
102	Go MSU!	1
292	From my home I can see approximately 25 wind turbines I have no problem with them.	1
147	Farmers and land owners where wind mills are located are very supportive because they receive payment. The rest of us have to live with wind mills in sight every day. Farmers signed contracts secretly without public knowledge. Why didn't we get a chance to vote on such an important issue BEFORE construction.	1
101	As part of the younger generation that is becoming a major part of not only our history but also future I feel this type of development is badly needed. It's a chance for us to help insure our existence and states financial stability. I hope that all residents may realize the need for change and support the good things that are to come.	1
319	As a citizen of Bingham township, I feel that the wind farms tried to push the start-up without informing the public enough. At meeting many questions were left not answered. 20 years from now we will know the effects, Good or Bad! I don't want to move!	1
943	All I know is from hear say which makes me neutral.	1
261	1st had no say in this matter. It began with personal choice of property owner (they have that right to choose). 2nd not enough proof to the public that putting these large turbines up, could pollute our well water (my right) due to how deep to dig & place cement to hold them up. 3rd locally to my knowledge the energy does not go to my household & they put so many regulations into place that if I wanted a small turbine placed on my roof the cost would not benefit me for 10 years, that's if regulation didn't change over and over. Utility companies want to make their money just like CA did in the 70's when president Carter tried to have natural energy.	1

362	#13 specific locations, with known high wind or wind conditions - yes	1
124	Wind turbines need to be regulated as to number per certain area, distance from residential areas, or individual homes. Not placed on shoreline property or in recreational areas. Not allowed within city or village limits.	2
125	Wind turbines are an absolute joke - 20 year old concept the taxpayers are paying for it and Huron Casting and Blue Diamond Casting are getting a cheap ride almost as bad as welfare. It's a taxpayer/government rip off!	2
273	Wind mills are an eyesore!	2
357	Wind energy is a plus for all. Because it is a natural energy. No fuels needed.	2
160	Why not use land fill and farms with pits for methane gas would be cheaper than wind mills. Only a few people get money from wind mills. Most are not from Huron County that set up the equipment.	2
707	While wind energy is unreliable because it is not always windy, it is a reliable producer of a portion of our energy needs. Wind will never produce all our energy requirements, but when combined with other technology will have a positive impact on our environment. Wind and other green energy sources will make the USA less dependent on foreign energy sources. Many people that oppose wind call themselves environmentalist, but only support alternative energy if it doesn't impact them.	2
383	What happens when the turbines are wore out & junk - who tears them down? Just junk on the land in my book.	2
760	We should be allowed to put windmills on our property. People with 1 acre or so are made because they are not benefitting from it, but are owns more acres and pay taxes on that land so we should be entitled to the windmills.	2
352	We own a very small amount of land in the county. We have turbines all around us. We had no input or was asked about them. We heard there was meetings throughout the year but was never told about them. Since the turbines the geese and swans have changed their flying patterns. We don't see them anymore. When there is flickering it lasts for 20 minutes.	2
123	We need to quit depending on oil and find other means of energy. This is definitely a step in the right direction. I hope they put one on my property.	2
334	We need to look to the future, and try and keep the power produced in our area.	2

## Table 16a (cont'd). Open-Ended Comments

741	We have no negative issues with the wind farm in Oliver Township. I hear more negative comments on the wind farm in the Ubly area but they are supposedly constructed with noisy parts that won't be practical on newer wind farms.	2
742	The wind mills do make noise and wouldn't want one within a half mile of my house unless it was on my land and I benefited from it being there. Can be annoying if too close. In my opinion on public land, on or off the shoreline would be a big no-no to Huron County for too many reasons. Agriculture land only.	2
257	The wind farm in Huron do not benefit us. The energy goes elsewhere. Companies are the only one that benefit. People just see \$ when agreeing.	2
869	The turbines did bring a lot of tourism at first (the first year and a half), but that has pretty much dwindled down to very few. I guess what I'm trying to say, it was very noticeable at first, but not now.	2
84	The questions were hard to answer just using a yes or no answer. I know people directly affected by having wind energy close to their home and people who have no problem living by them. In the last election I could not vote on the wind energy proposal even though they're all around me.	2
288	The promise said our electric bill would be cheaper which it is NOT TRUE, if any it's higher. I certainly would not want them running through my town.	2
38	The people opposed to wind development are not informed of the bigger, longer term picture. Need to educate.	2
430	Q's could be in the "clear understanding" area of such.	2
355	Put the wind mill on federal and state forest up north	2
394	Please send more information.	2
200	People who have wind turbines on their property and receive money from them are in favor of them. People who live near turbines and don't own the property they are on and therefore receive no money from them are more apt to be negative about them (their noise & shadows).	2
560	Overall agree with wind energy.	2
256	It would be nice to see at least some of the created energy stay in Huron County creating a decrease in Huron County resident's energy costs.	2

155	It would be nice if you live by a wind farm or votes for it, would get to benefit from it. By lowering my electric bill. Also I believe in clean energy, helps end oil disputes.	2
79	If I had land I would most certainly have some on my property. Also there is a difference between air cooled and water cooled turbines.	2
272	If generous setbacks where in place I would be much more in favor of wind mills.	2
244	I'm totally for these wind turbines, but not in our Great Lakes. There is enough land for them to be on . The turbines are awesome.	2
192	I would like to be able to put a small wind turbine on my property for my own electrical usage.	2
89	I was born and raised 2 miles from Elkton.	2
716	I understood when this was first discussed that we would benefit in our own community, by helping our utility bills to be less. I don't understand who benefits from these wind turbines?	2
64	I think if the electrical energy produced by the wind mills in Huron County was utilized in Huron County and that energy benefited all residents in the county, I would then agree	2
990	I only own 4 acres. My lot is too small for a windmill. I like the way windmills turn with the wind.	2
902	I have seen that it brings business to area. It seems that it takes so many of them that it does RUIN the attraction. They do bother people when placed too close to people. The ones on the west side of county seems to have different affect on people than the east side. West side seem better.	2
286	I have not looked into most of this to be very knowledgeable on these questions. Would be willing to be open-minded and learn more.	2
59	I have no opinion regarding this matter. I haven't researched it; listened to; read or participated in any conversation about it. They are one mile from my home, but I haven't gathered info to form an opinion	2
608	I have heard on the radio that millions of \$ will be given to local schools. I work for a local school as far as I know we have received \$0 from the 68 we now have.	2

118	I don't think turbines should be placed close to homes and that is why I wouldn't want them on our land as there are two homes right next to the property. I also like the fact that the turbines being built there has brought work to our area which we really need.	2
988	I don't know what is wrong with the people of this county or the rich ones that live on Sand Point or along the lake. We need progress in this County - the wind farms help!	2
781	I do support wind energy, but I do not agree with out sourcing work for NON-LOCAL workers. If the area workers can't get the contracts, I don't want the wind turbines.	2
600	I do not think that cost of development and repair are worth it.	2
473	I do believe it's a positive step	2
111	I am at a farm that has several wind mills on it and is part of a wind farm. I am outside within range of them several times a month. I have not seen or experienced any of the negative affects I have read about. I fully support wind farms in Huron County.	2
556	I am all for the wind turbines.	2
376	I am a recent resident to Huron County, but I love it here. I plan to raise my 4 year old son here. The wind turbines are innovative and beautiful. We encourage more wind energy in our area!	2
433	How much of the energy created by the now existing wind turbines goes toward OUR electric or energy costs? It doesn't seem to be making our (the consumers) energy bills any less. So where does all the new renewable energy go?	2
212	Have not seen a reduction in electric bill yet since they been in township	2
522	Every since we have wind turbine my electric has doubled because of distribution.	2
240	Does not help the taxes in the county as they are exempt for 10 years. They are not feasible w/out help from the govt.	2
219	Because my farm land is so small I could not allow any apparatus to take up room thus making my income reduced.	2
466	Would like to know more about the rules and regulations of both wind farms and personal wind turbine use.	3

136	Without subsidy, wind farms would not be practical. When subsidies	3
	disappears turbines will be abandoned. Yet they will still chop up birds, pose dangerous unmaintained turning blades, fall off, and remain eyesores.	
287	Wind mills are progress and a sign of our future energy.	3
931	Wind farms are good in deserts & wilderness but not in farm land and living amidst them. The light and noise are not tested yet and will harm a lot of humans and animals. I'm sorry to think that the beautiful sky and county may be gone.	3
270	Wind energy isn't just a 'symbol' of progress - it is progress but wind energy has been around a long time. Where have you been? I TOTALLY BELIEVE IN WIND ENERGY. I DO NOT BELIEVE IN WIND ENERGY IN SUCH A POPULATED AREA.	3
964	Why can't a person that owns property in a village vote on this?	3
297	We live in the village of Port Hope - small town, 300 people; we own home for 23 yrs.	3
930	Too many unknowns at present for me to support - expense, longevity, viability at several levels, etc	3
533	Tip of thumb in Huron County would be perfect for wind mills. Shallow water and lots of wind.	3
427	The turbines are not in our area yet, but is scheduled to be built in the next couple years or so.	3
836	The question I have and it's not new - why locate wind farms so far from where the greatest demand is. The added cost of transporting the electricity a distance doesn't come up in discussions but it is a valid point economically.	3
792	The general public is not sufficiently informed to make an intelligent decision. The negative reaction I've heard is from those in other states who have wind energy.	3
221	The companies lie, and will tell you anything to get you to sign the contract.	3
775	Thanks for letting me take your survey.	3
772	Put them 25 miles EAST of Port Hope.	3

553	My biggest concern is they are putting them too close to residential houses with no regard to the homeowners - 1300 ft set backs are TOO CLOSE! Second property values decline no one wants to live by these turbines! The lack of consideration towards the 'average Joe' some owner is very disturbing!! There are already many problems in Ubly!!	3
863	Know nothing about wind energy development.	3
584	It is a waste of tax payer's money. That could be used for better things - they will build bigger better energy plants - that will work good. The towers will be junked then. Save the money for the future.	3
680	It has not reduced my electric bill.	3
313	Inserted 3 pages of comments - visually unappealing, low frequency noise, etc.	3
331	If wind energy was a viable solution I would be more in favor of it. The gov't should not have mandated an unrealistic solution to our energy needs. With food demands growing turbines should not be put on prime farmland. If they were viable & cost effective they should go on non-productive land or water.	3
566	If they are placed along the coast they will lower already decreased property values. I would try to sell my house and move.	3
861	If MI's elimination of the personal property tax includes wind mills I would strongly oppose them in every aspect. Huron Co has received approximately \$250,000 in tax from these windmills. While I support the elimination of this tax, I do not want it to include windmills. I also think that the only reason that we are even seeing these windmills is because MI is demanding that a % of energy is "renewable." If windmills were profitable for these companies, you would have seen them prior to this government mandate. Hence I feel that they will cost energy prices to rise. Clean coal and nuclear are better options but Obama and other environmentalist cry too much about them.	3
447	I would support wind energy IF wind energy could support itself. No subsidies should be used. I think that wind energy will raise our electricity. Clean coal or nuclear.	3
801	I would like to see more evidence whether turbines are or are not a health risk.	3
78	I would like to know any long term affects it might have on wildlife and humans.	3

7	I would be more positive if the energy made in Huron County would stay in the county to help reduce the charges for electricity. It is my understanding	3
	that the energy is sent to the 'grid' which services Eastern states.	
890	I wish they never came up with this wind farm. It makes cows not milk,	3
	makes horses lay down, make chickens not lay eggs, and is very UGLY on our beautiful land scapes. Who thought this up? CHINA?	
227	I was one of the first and few in the county to install solar panels on my home for heat about 20 years ago. So am very supportive of renewable energy.	3
936	I think wind energy is a plus for Huron County and will bring in money and cheap energy.	3
140	I think the wind farms are very important and the wind is free!	3
752	I strongly feel the need for wind energy to replace some of fuel brought from foreign countries - must start to use natural resources - more	3
	nom rotergn countries - must start to use natural resources - more.	
528	I have not seen my electric bill go down. I have been told that the power generated in Huron County is not used in Huron County. The only people or company that benefit are landowners with wind farms and the power	3
	company who own the turbines - \$\$\$\$\$ - money, that is all it's about.	
629	I have concerns about the effectiveness of the wind turbines on the long- range picture. Once government ceases to subsidize. Lalso have concerns	3
	about what happens once they age.	
652	I had 40 acres on Brining Rd, Port Hope, MI. But sold it in 2003. I do support wind turbines.	3
536	I do not like our night sky - to many towers & red lights, but to move forward, we must live with them. The towers provide cell phones & paging services for EMS, windmills provide tax dollars, jobs & clean energy.	3
450	I am highly disappointed in our BOC & Zoning Director (Lundberg). I don't understand how elected officials can ignore a petition with that many signatures when this all started. I believe they fell all over themselves to approve this when they had the opportunity to slow this down and come up with zoning (set backs) the citizens of Huron County could all approve of. We all must live with this now!	3

## Table 16a (cont'd). Open-Ended Comments

704	Huron County, the Thumb area is such a lovely place, it's the 'forgotten' up North. We moved here from a big city, with all the distractions. You can see forever over farm lands, cute villages by the lake, just all green forests. It seems that it is pure, no obstructions just great nature. Now with the wind farms it looks like something from the moon has landed here - ugly. We know all about them and consider them a get rich quick deal.	3
420	GO FOR IT	3
410	Filled out the best I could: Don't know a whole lot about wind energy.	3
802	Don't want them on our coast line or anywhere near water.	3
882	As you can see by my answers I'm not educated on wind energy. I won't be around much longer! So, I remain neutral on the subject!	3
342	After living near the turbines for 1.5 years, I believe they are detrimental to people. I don't sleep very well, I get more headaches than before, more irritable heart flutters. Never had these problems before the turbines.	3
982	Above, "on my property" question - living ON Lake Huron, I can't visualize a wind "farm" but one maybe. I have seen the trucks hauling parts for wind turbines and they are HUGE. The wind turbines along I40 are HUGE when assembled.	3
911	Zoning was rushed through by county commissioners, NOT the public. Easements need a greater distance. This type of energy source needs to be developed, however, the public's concern NEED to be addressed. I am all for it, but I do not want one flickering in MY backyard, hear the hum, or the blades	4
387	Wind turbines contribute nothing to Huron County. No buildings of machines. More labor to operate, do not make effective use of land compared to stationary power plant. Without gov't subsidy would not succeed. Let's hope we can move ahead now we don't have the governor bimbo!	4
416	Wind mills are good for the county and the environment and I support further development. At the same time I don't want to look out my window and see one every day.	4
562	Wind mills are a form of "industrial pollution" of the landscape and the environment. They benefit the few and damage the aesthetic experience of the many. They are bad for wildlife, esp. migrating birds. They are unsightly and unnecessary!	4

329	Wind farms are too expensive for the energy return they get back. I worry about the monitoring of the wind mills and how long they will last. Nuclear energy is the way to go.	4
850	Wind farms are a waste of money relative to the amount of Energy they produce.	4
925	Wind energy is one of many alternative energy sources that allows us freedom from foreign sources of energy - A step in the right direction.	4
302	Will become increasingly detrimental to the environment and landscaping. Anyone who thinks that the turbines and upcoming electrical lines will improve the landscape are 1st class idiots.	4
815	What happens to the birds flying into them? I heard about the blades coming off already.	4
941	What happens when a tornado hits a wind turbine?	4
945	We need more wind farms in MI.	4
398	We moved to Huron County last year and were in awe the first time we drove by a wind farm. We have seen them in other countries, but not much in America. In our opinion, Huron County is a windy place that could use the economic boost that even more wind farms could create. *However, we have seen how only land owners are seeing any benefit from wind mills. The communities around wind farms should see some benefit for all citizens.	4
67	Use nuclear or solar systems. Nuclear for bulk of energy (proven, reliable, clean). Solar for home use w/ zoning restrictions.	4
196	Use any energy money to drill for oil and gas and to build nuclear plants.	4
709	Too many greedy people mess a good thing up!	4
873	This is probably not to too useful. My knowledge of wind turbines would fit on a postage stamp, with room to spare.	4
800	They should be considered light industrial for zoning purposes and then should comply with zoning requirements. The number should be limited in any given area. The companies need to be bound to removal terms when they become obsolete or in disrepair. The problem w/this survey is you have not given a definition of 'wind farm' and we must guess at what you mean exactly.	4

Table 16a (cont'd). Open-Ended Comment	nents
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974	The wind here on my property is constant, on average out of 30 days, the wind blows at least 20-25 days of that.	4
621	The cost of electricity in the areas where they have turbines has not decreased for the residents for the trouble they cause, I do not think they are worth it.	4
494	The concept of wind energy is useful, however as it has progressed in the county it has what seems to be nothing but a political gain among some and to my knowledge no jobs have been created locally and the companies have made money from the federal government to install those to our demise.	4
813	The best place for wind turbines is in the dead lake of Huron. The lakes' fishery is gone and all that dead water might as well be used for something.	4
842	Thanks for asking!	4
267	Thank you for this survey - the questions were excellent! I believe the thumb of MI is a great place for wind energy simply because of the location.	4
840	Revenue sharing or lack of is a MAJOR issue. Why him & not me if I'm affected?	4
94	Question 8 - part 15 should be able to bring economic benefits. Question 11 should be beneficial.	4
171	Pro wind energy.	4
506	People need to think outside the box and realize that renewable energy is where it is at. Get with the program!	4
215	New innovation is good as long as it doesn't cause health problems or take away from the value of life or effect negatively our environment or the health of wild life.	4
975	My son built Solar energy on his house. It had a nice heat, very clean. I liked it very much. Wind or solar - I liked them both. Solar didn't bother anyone. Would prefer solar.	4
732	My parents have a wind test site on "our" family farm. I now own land beside it and am positive about the possibility for several reasons.	4

156	Most of the people of Huron County were not given the opportunity to vote on wind mills. Every nation that has tried to use this technology as a source of energy has abandoned them - see Spain. Hoping to sell my property before they put these eyesores around us and decrease my property value.	4
24	More information needs to be known from people who already have them on their land, I would like to know their feelings about wind energy.	4
475	Many years ago my dad had the vision of wind turbines. He felt and stated he could see it coming in the future. He died before seeing his vision come true, so I'm here to carry it on. They're beautiful in the horizon and I love to see my grandkids faces when they see them. I am and always will be a supporter. The country needs more Education/Info on them though - including myself.	4
769	Love to see the study's findings. Thank you for writing this term paper. Good luck.	4
170	Living in the city makes it difficult to answer questions on your survey.	4
205	Living in Harbor Beach, I would prefer a DTE wind farm to the present DTE coal-fired power plant in my neighborhood.	4
210	It seems there needs to be more data on health issues to people living close to turbines. Huron County should not be turned into one giant wind farm. There needs to be a limit on the number put in the county. Where is the economic plus to the residents of the county?	4
715	It could help out if that would help us with our electric bills. Bring the cost down.	4
513	I'm the wife – my husband is deceased.	4
72	I would be more in favor of the wind development if they were co-op owned by the people surrounding & owning the land versus allowing them to be bought and sold like a mortgage to the highest bidders with many contracts given to out of state people for projects with huge tax implications & benefit for them but little to none for us as landowners. In fact my energy bill is increasing because of these wind mills in our area and the "cost" of upgrading the grid.	4

739	I think wind turbines are a good thing for Huron County. It is windy in our	4
	area, so good to create energy naturally. It brings in taxes to the county and	
	creates jobs to maintain them.	
12	I think wind farms are much better and less polluting than fossil fuel,	4
	HOWEVER they should not be on productive land. (Poor land, water,	
	desert, O.K.) we already have a lot of good land covered with concrete.	
296	I think they are attractive. It's like being in Holland. It would be nice if	4
	MORE PEOPLE got a "PROFIT" on the turbines than making just a few	
	farmers RICH! These farmers are usually tight with their money and not	
	sharing easily with public. The more the greedier.	
267	I think the wind forms are a most of a hundh of monor that mostly comes	4
507	from the government. If there is a place for renewable energy it is out in the	4
	from the government. If there is a place for renewable energy it is out in the	
	turnically always maying. The wind forms have mined the network look of	
	typically always moving. The wind farms have ruined the natural look of	
	the land and or change or commercialized it.	
82	Lthink that wind farms are wonderful and a positive for Huron County	Δ
02	i think that which fains are wonderful and a positive for flaton county.	-
620	I think that we have enough wind turbines now.	4
020		
361	I think people in Michigan as well as Huron County need to get more	4
	informed about this issue. It could be beneficial for so many people in this	
	area. Thank you for the survey. We all need to be educated on this issue.	
977	I support the turbines. I hear the energy from existing turbines goes to	4
	Detroit. We need it here!	
858	I strongly believe the turbines should not be put into the lakes!	4
713	I have had solar (heat only) on my home since 1977 I never regret the	4
715	decision I believe everyone can benefit from solar wind or other sources of	·
	renewable/sustainable energy sources.	
690	I feel they are a clean energy source. Possibly hazardous to people living	4
	nearby them. Basically unsightly addition to our landscape.	
<b>7</b> 06		4
580	a don't understand notning about wind energy.	4
722	I don't know for sure if wind energy is safe or not. I think some people find	4
	fault with change - will make something negative out of good. I don't have	
	any turbines near where I live, so I can't really say if the noise would bother	
	me or not.	

855	I don't have any comment. Thank you.	4
728	I don't believe the wind turbines are any more unsightly than the electrical lines & poles we have now.	4
85	I do not support wind farms due to the high cost of electricity produced. When the technology is improved to yield a competitive price then I will support it. No problems with the idea. More research is needed before we proceed.	4
444	I believe wind turbines are a good idea as long as county land owners were compensated fairly, also creating more jobs. I do not believe we should have turbines on our shorelines or in the water	4
678	I believe Wind Energy is needed in Huron County.	4
500	I am not against wind energy. I am against building them to close to houses. The allowable distances should be pushed back to minimum of 1 mile from a house. Build the windmills on wasted state land up north, then the state could put the revenue back into schools. I also do not think windmills are profitable w/out subsidies.	4
175	I am for clean, renewable energy resource & development. I sympathize with local land owner's concerns & though I disagree with those who oppose wind farms, I think their voices need to be heard and issues addressed with care and integrity of information. I do not feel information on why we should support wind farm development has been communicated well enough.	4
530	I am a retired electrician. I have worked on many powerhouses in my day. (Coal, oil, gas, nuke, etc) Wind is the cleanest I have ever seen. And no fuel.	4
503	How much money from a turbine actually stays in the county? Also what is the payback time for a turbine and is the landowner really benefitting financially from them!	4
116	Driveways need to be placed where they are convenient for farming around as well as convenient for the turbine companies	4
642	Don't put them near the lake. It's a beautiful site don't ruin it.	4
380	Don't like how they only use farm land instead of State land. The way the leases are worded they could take all of a person's land for their turbines and leave that farmer with no land to till.	4
341	Designated recipient died in 2007	4

Table 16a (cont'd). Open-Ended Comments

Table 16a (	(cont'd). C	pen-Ended	Comments
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520	Cost too much tax payer money for the little bit of return of energy - need something high that WORKS!	4
469	Contracts are of great concern to land owners who may end up with liability issues or be stuck with an eye sore. Landowners cannot trust the wind companies to be fair with regard to money.	4
472	As long as large utility companies have the right of way they will put wind turbines anywhere they want.	4
6	Answered by Landowner - brother to original recipient	4
688	Although wind turbines are rather large, I don't consider them unsightly, noisy, or a threat to humans or animals. In days of economic hardships, alternative energy sources should be accepted with open arms.	4
188	10 years from now they will be obsolete. Our government is footing the bill. Workers are very much over-paid. Advances in technology with make them useless. Components are sent into this country from overseas and companies will reap the money at the taxpayers' expense. Money down the DRAIN. Edison can produce electric for a lot less.	4
960	#13 I think you have good guidelines as to where they are set and I agree with the guidelines as they are. I think wind energy is a great way to go. Where would we be if people would not have wanted electric poles along the roads??	4
	I do not like the flashing red lights on the wind turbines in the night sky.	
	But I will say in one simple sentence, that I am definitely NOT a fan of them.	

## **APPENDIX E**

Survey Response Rate Graph





References

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